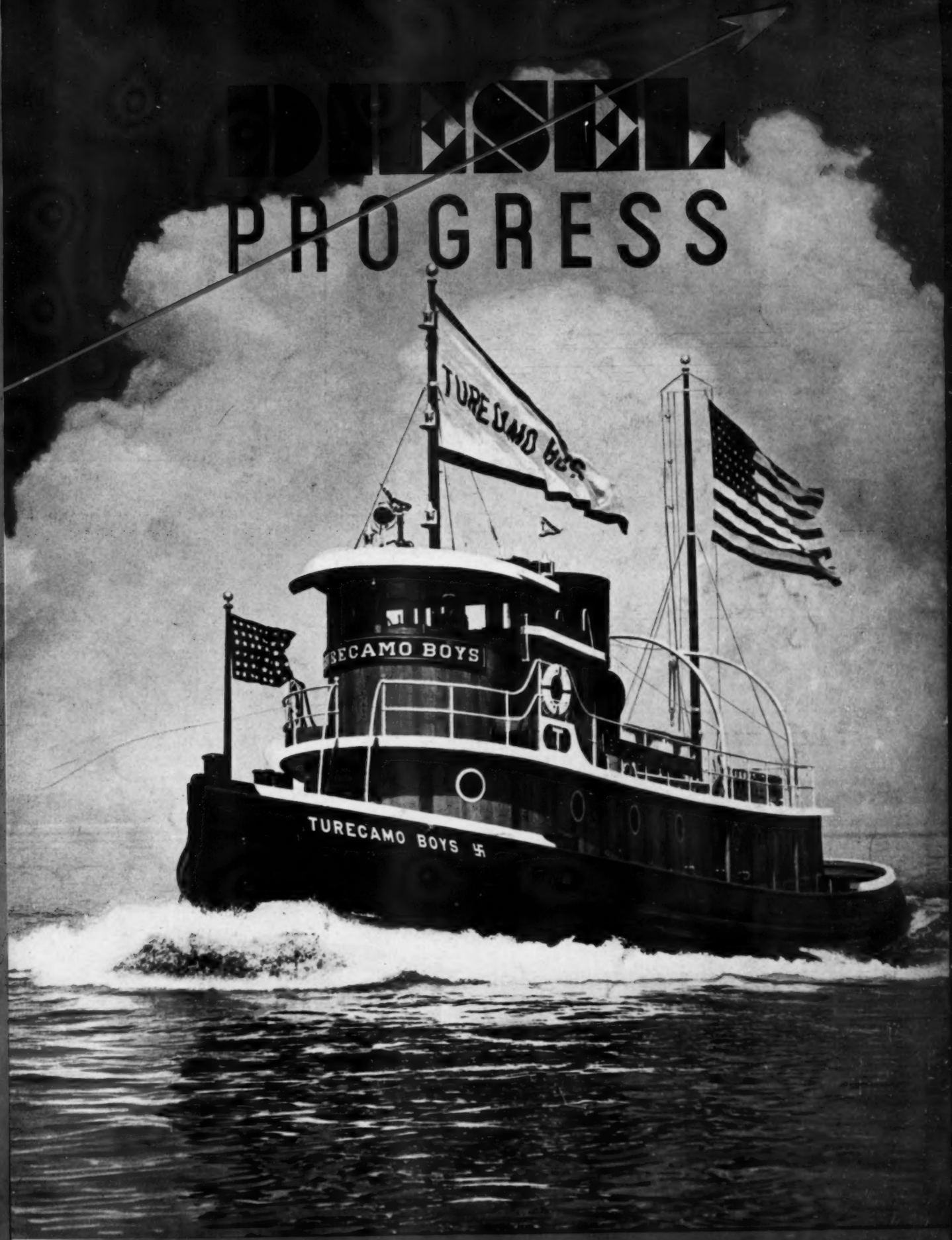
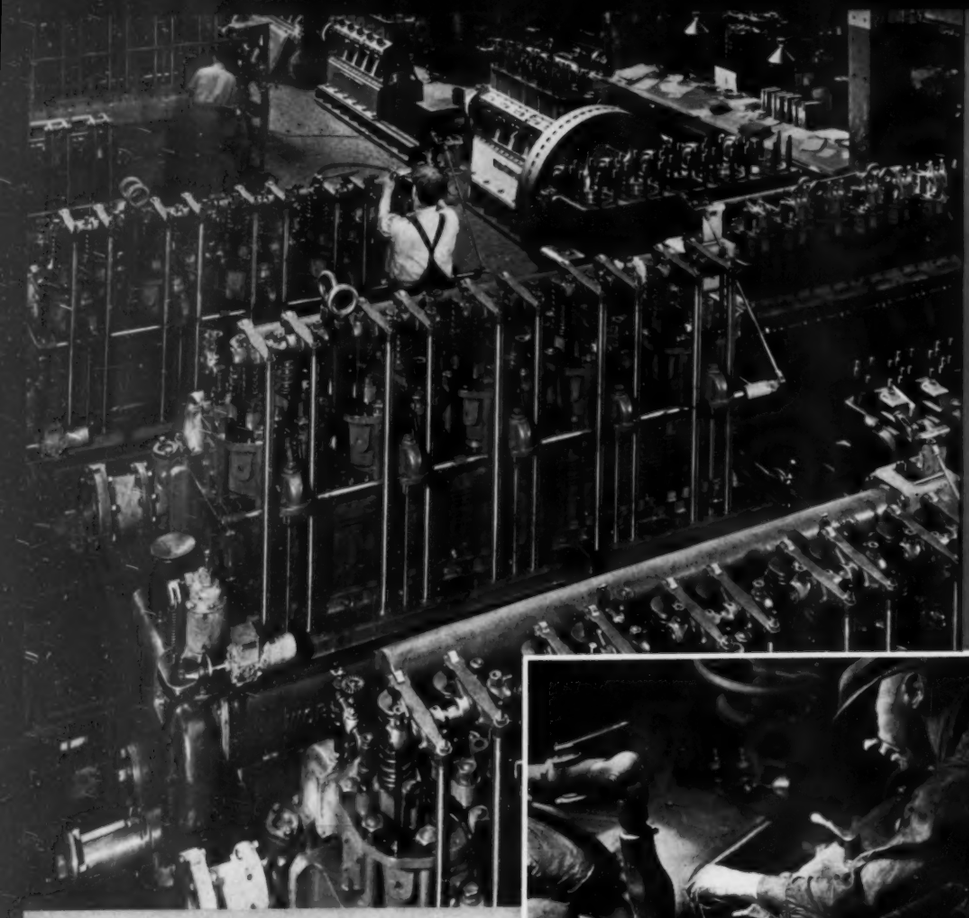
DIESEL PROGRESS

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR



JULY, 1936 CIRCULATION OF THIS ISSUE—IN EXCESS OF 10,500 COPIES 25c

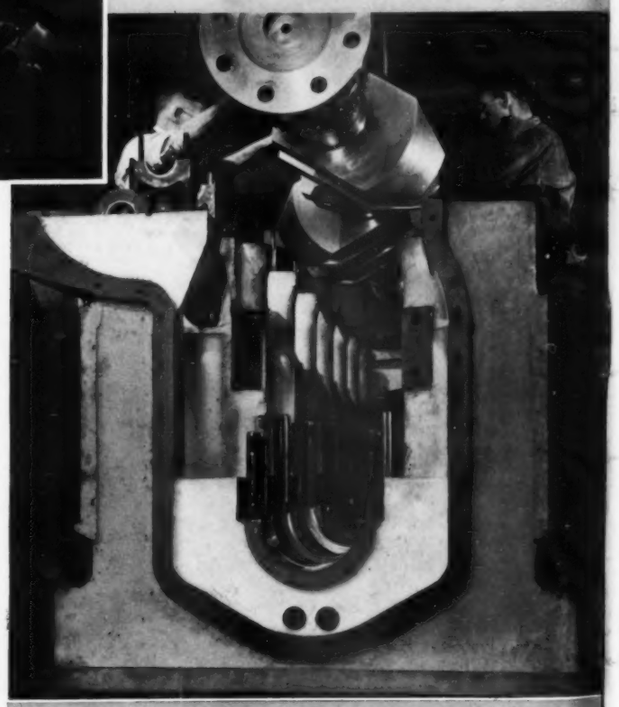


It takes months to build a large Diesel engine. It must be assembled, tested, torn down for inspections and re-assembled. Above is the assembly floor in the plant of a large builder. Gulf lubricants are used for engine "run-ins" and for the lubrication of all mechanical equipment throughout the plant.

DIESELS ARE BUILT WITH CLOSE TOLERANCES

GULF PARVIS OILS PRESERVE THEM

Each piston must be accurately built for its individual engine. At the left, a mechanic is carefully calibrating the diameter of a piston which he is grinding to exact size.



Great care has been taken in finishing this shaft to extreme accuracy and balance and to provide a perfect fit for bearings and shaft journals. Gulf Parvis oils minimize wear and preserve close tolerances.

PISTONS, WRIST PINS, MAIN BEARINGS AND CRANK SHAFT BEARINGS *need a lubricant of highest quality to minimize wear*

WHEN the precision methods employed in the modern Diesel builder's plant are observed, the need for lubricants of highest quality to safeguard closely fitted parts is apparent.

That is why leading builders—as well as thousands of operators of Diesel engines—use Gulf Parvis oil. This high quality lubricant has been treated and purified by the finest of the new selective solvent processes. It stands up over long periods of service—costs less to use in the long run.

America's Diesel engine builders—more than 50 strong—have placed their stamp of approval on Gulf Diesel lubricants. Let these quality oils prove their economy and efficiency in your equipment.

GULF OIL CORPORATION—GULF REFINING COMPANY

GENERAL OFFICES, GULF BLDG., PITTSBURGH, PA.

GULF INDUSTRIAL LUBRICATION

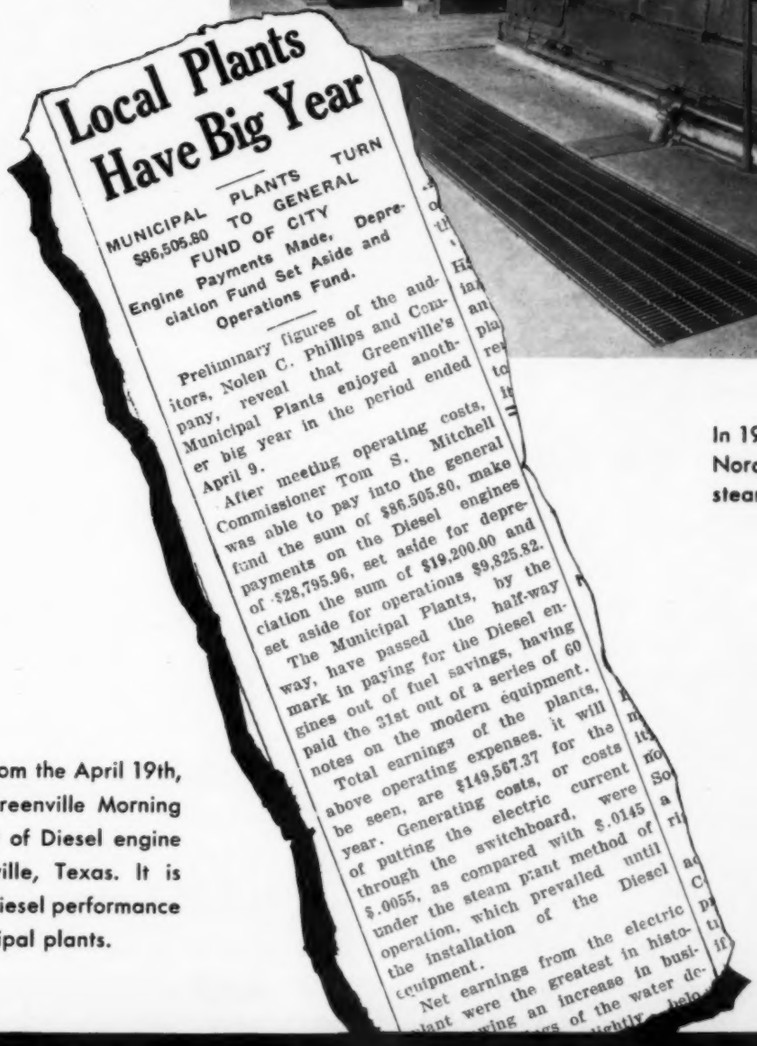
Makers of that Good Gulf Gasoline and Gulflube Motor Oil

DIESEL PROGRESS for July, 1936. Volume II, No. 7. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at Brooklyn, New York, authorized May 14, 1935. Subscription rates: United States and Pan American countries $3.00, Canada and all other countries $5.00 per year. Single copy price 25 cents in U.S.A., 50 cents for all other countries.

NORDBERG DIESEL ENGINES

make possible an annual return to the general city fund in the amount of- $86,505.80

In 1933 these two 875 and 1200 KVA Nordberg Diesel units replaced the old steam equipment in the municipal plant at Greenville, Texas.



Local Plants Have Big Year

MUNICIPAL PLANTS TURN $86,505.80 TO GENERAL FUND OF CITY

Engine Payments Made, Depreciation Fund Set Aside and Operations Fund.

Preliminary figures of the auditors, Nolen C. Phillips and Company, reveal that Greenville's Municipal Plants enjoyed another big year in the period ended April 9.

After meeting operating costs, Commissioner Tom S. Mitchell was able to pay into the general fund the sum of $86,505.80, make payments on the Diesel engines of $28,795.96, set aside for depreciation the sum of $19,200.00 and set aside for operations $9,825.82.

The Municipal Plants, by the way, have passed the half-way mark in paying for the Diesel engines out of fuel savings, having paid the 31st out of a series of 60 notes on the modern equipment.

Total earnings of the plants, above operating expenses, it will be seen, are $149,567.37 for the year. Generating costs, or costs of putting the electric current through the switchboard, were $.0055, as compared with $.0145 under the steam plant method of operation, which prevailed until the installation of the Diesel equipment.

Net earnings from the electric plant were the greatest in history, showing an increase in business of the water de-

This clipping taken from the April 19th, 1936 issue of the Greenville Morning Herald tells the story of Diesel engine operation at Greenville, Texas. It is typical of Nordberg Diesel performance in many municipal plants.

NORDBERG MFG. CO.

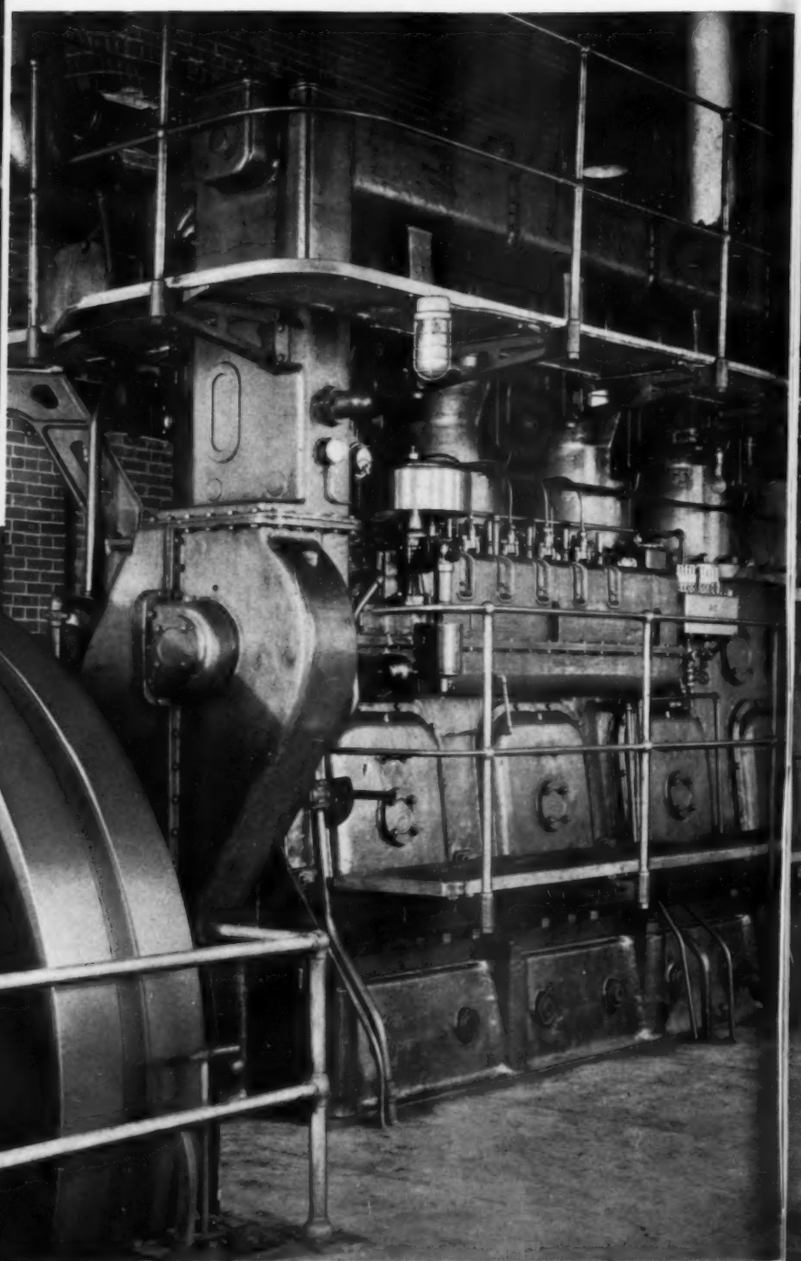
MILWAUKEE, WISCONSIN

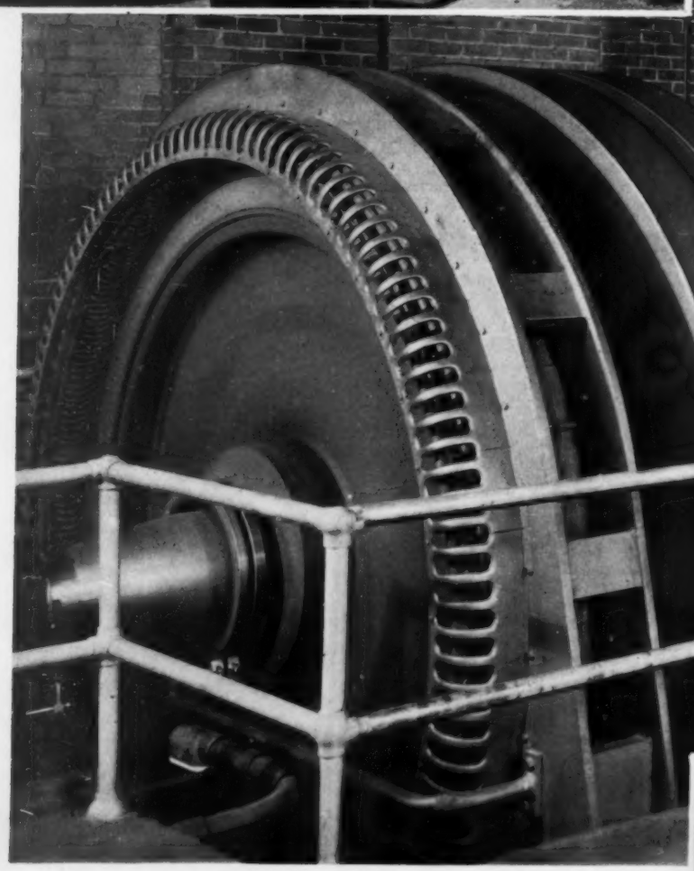
NEW YORK CITY	WASHINGTON, D. C.	CLEVELAND, O.	KANSAS CITY, MO.	DALLAS, TEX.	LOS ANGELES, CALIF.
60 E. 42nd St.	917 Barr Bldg.	318 Rockefeller Bldg.	2 W. 62nd St.	3801 Potomac Ave.	Subway Terminal Bldg.

THE OIL THAT LUBRICATED THE DIESEL IN 1901

Saves THOU

BACK IN 1900, in a small workshop, the first Diesel was born. Before it could be operated satisfactorily, adequate lubrication had to be provided. So the makers of Gargoyle lubricants—the outstanding lubricants then, as they are now—were called in to work with the inventor . . . and a new oil, the fore-runner of Socony-Vacuum's Gargoyle D.T.E. Oils, was developed. With the aid of this lubricant, the economy of the Diesel engine was made available to industry.





"PROFIT INSURANCE" is important in Diesel operation. That's why shrewd operators, after comparing Diesel lubricants, are buying Gargoyle D.T.E. Oils. They find these oils are clean after years of constant use . . . that cylinder wear is minimized . . . that dependable operation is assured.

GARGOYLE

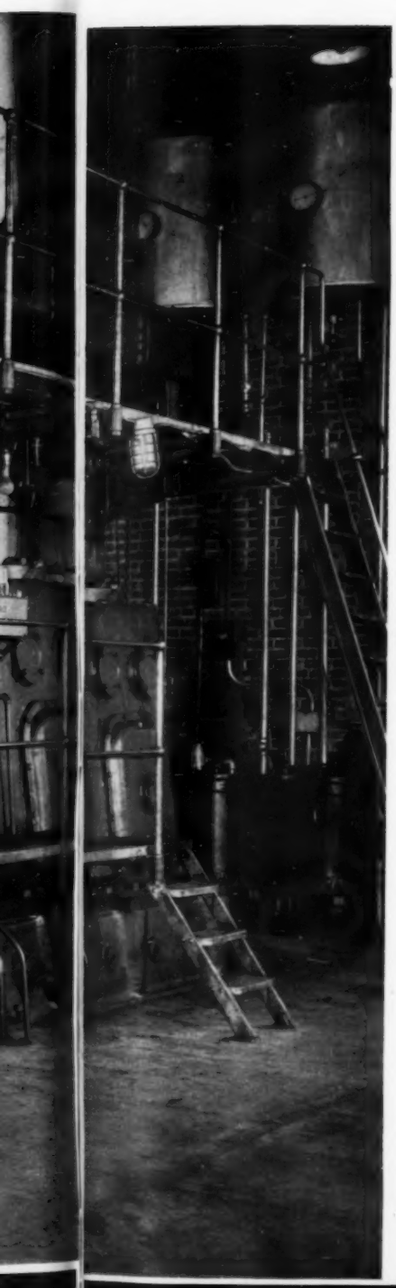
Lubricants

SOCONY-V

STANDARD OIL OF NEW YORK

WADHAMS OIL COMPANY . MA

OUSANDS *of Dollars for Operators* TODAY



Gargoyle D.T.E. Oils—the standard for years—continue unsurpassed in uniformity, quality and economy

IT TOOK THE RIGHT OIL to make the Diesel possible—an oil made by the makers of Gargoyle lubricants. Since then we have worked with Diesel builders, often over the drafting board . . . aiding in the solution of lubrication problems which today are giving you operating economies never before dreamed of.

From this close cooperation were developed the Gargoyle D.T.E. Oils that are producing efficient service in thousands of installations. The record of these oils has won them the recommendation and approval of 22 out of the 26 leading builders of Diesel engines.

Take the word of these men who know Diesels . . . who know oils—protect your investment and your operating profits with the right grade of Gargoyle D.T.E. Oil.

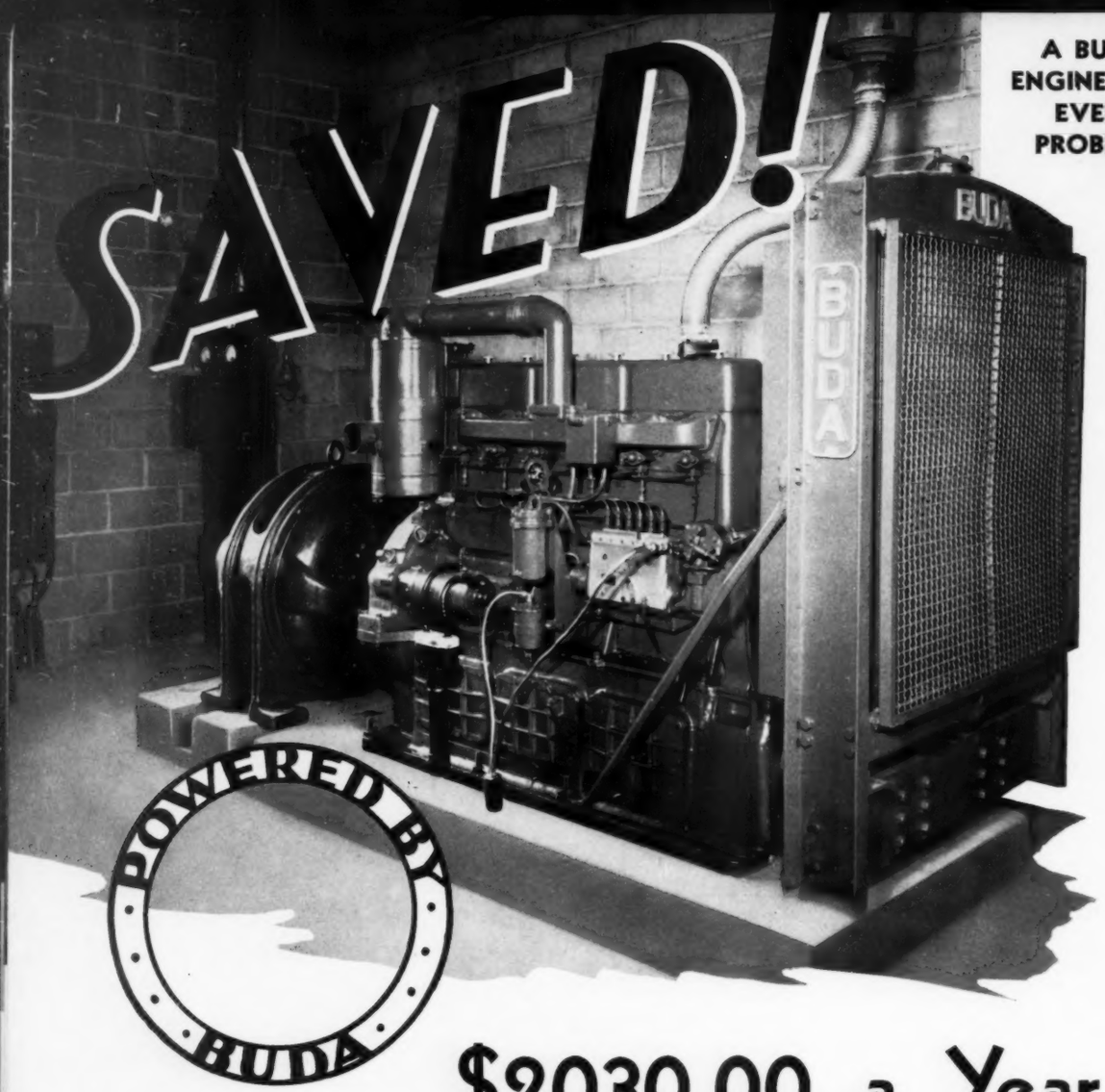
Let us show you results obtained by operators running the same Diesels you are responsible for. The figures are often astonishing. Cleaning periods have been pared to a minimum. Inspections after years of operation have shown extremely little wear in the cylinders. Savings in fuel and maintenance alone have materially paid for the cost of lubrication.

This great performance has resulted in Socony-Vacuum lubricating the world's largest Diesel engine and 65% of the world's Diesel-driven ships.

What we have accomplished for thousands of others, we can do for you! A Socony-Vacuum man will be in your plant soon. He's had a world of experience with the world's finest Diesel oils . . . he's backed by Socony-Vacuum's exclusive asset of 70 years' lubrication experience. Let him cooperate with you and your men.

Y-VACUUM OIL COMPANY, INC.

NEW YORK DIVISION · WHITE STAR DIVISION · LUBRITE DIVISION · WHITE EAGLE DIVISION
PANY · MAGNOLIA PETROLEUM COMPANY · GENERAL PETROLEUM CORPORATION OF CALIFORNIA



$2030.00 a Year

WHAT are *you* paying for light and power? In 1934, the United Milk & Ice Cream Co. of Chicago Heights, Ill., was paying 36/10c. per kwh. This year a Model 6 LD-909 Buda-Lanova Diesel Generator set with a 75 kva. G. E. Generator has cut power cost to 11/10c. a kwh. and will save $2,030.00 a year.

And that isn't all! A large eastern manufacturer of ice creams and candies formerly paid 3½c. a kwh. for light and power. They installed a Buda 6 D415 Diesel Generator set with a 37½ kva. Generator and cut their power and light costs to .00814c. per kwh.—slightly more than 8 mills. Over a period of 8,759 hours' operation savings totalled $4,545.00, including the sale of surplus light and power to two other stores who in turn thereby reduced their expenses.

These are but a few of a long list of similar cases where Buda Engines have made money for their owners.

Perhaps you are interested in power in some other form. There is a complete line of Buda Diesel Engines for every power problem. Our engineers are at your service!

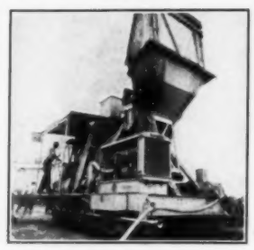
THE BUDA COMPANY
Industrial Division K
HARVEY (Chicago Suburb) ILLINOIS

BUDA ENGINES

A BUDA ENGINE FOR EVERY PROBLEM


Mine Locomotive


Shovel

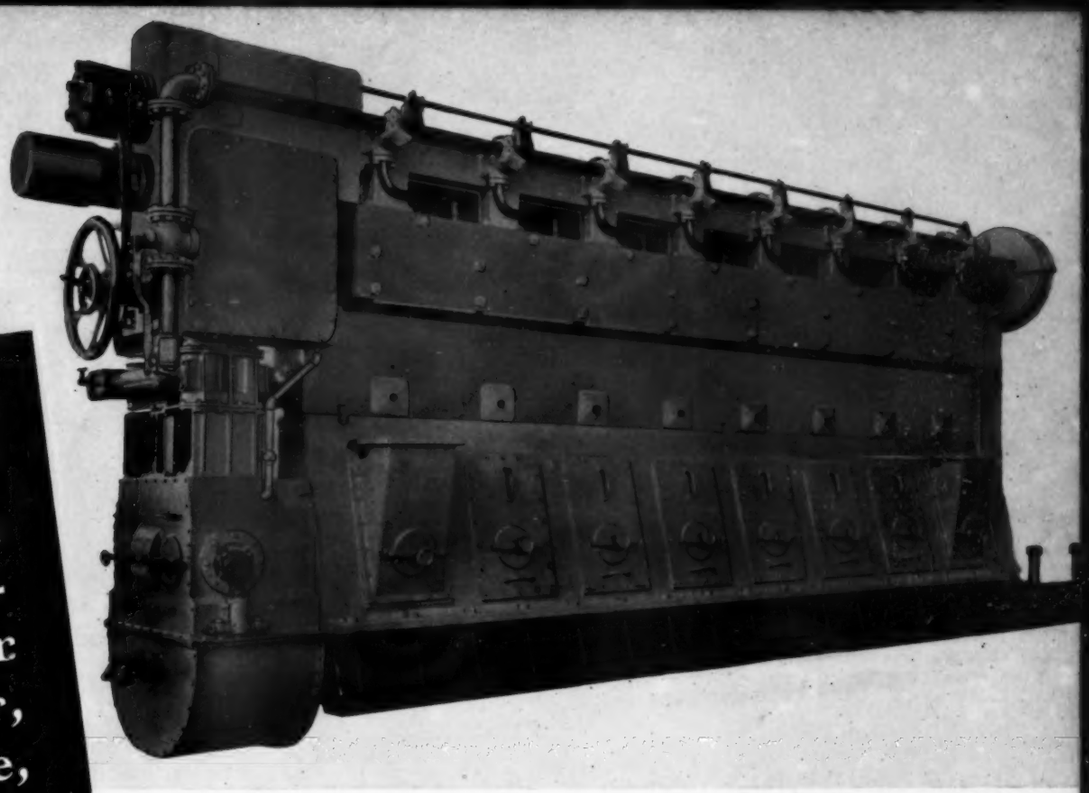

Pavers


Rollers


Pumping


Portable Compressor


Hoist

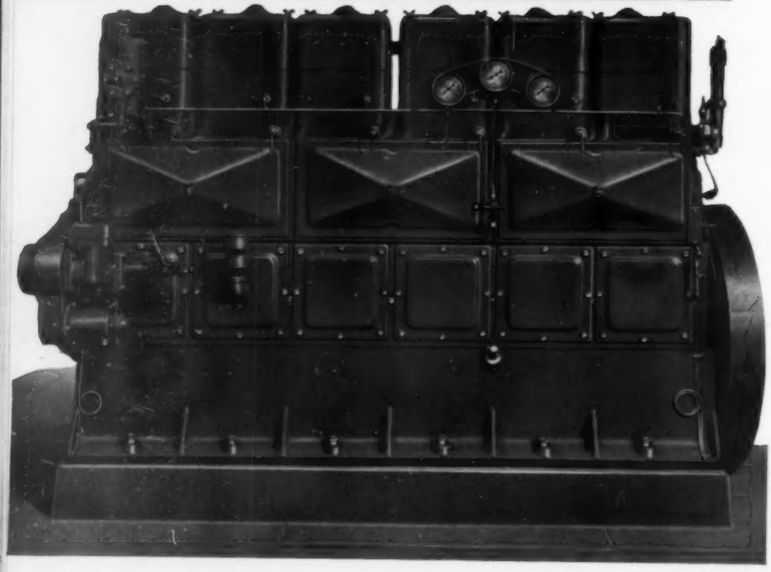


ERIE crankshafts selected by the Winton Engine Corporation for their eight cylinder, 17″ x 26″, 4 cycle, Model 8-157-A Diesel engines, developing 1200 hp at 250 rpm.

CRANKSHAFTS

The confidence placed in Erie by leading Diesel engine builders is proven by the repeated use of Erie crankshafts. We believe their confidence has not been displaced. Where fine quality and accurate finish are necessary insist upon the best.

ERIE FORGE COMPANY, ERIE, PENNSYLVANIA



What's BACK of the DIPPER?

THERE are few operations in the construction industry that hold the interest of the contractor and the observing public quite as much as the working of a power shovel. The performance of the power shovel is fascinating to the onlooker—it means cold cash to the contractor. Both are interested in one question: "What's back of the dipper?"

As far as Diesel Shovels are concerned, the usual answer to that question is "Atlas Diesel," for there are today more excavators powered with Atlas Diesels than with the engines of all other Diesel manufacturers combined. Atlas Diesels pioneered the excavating field. They provided just what the contractors wanted—equipment built to withstand a beating—engines that would move maximum yardage at the lowest possible cost.

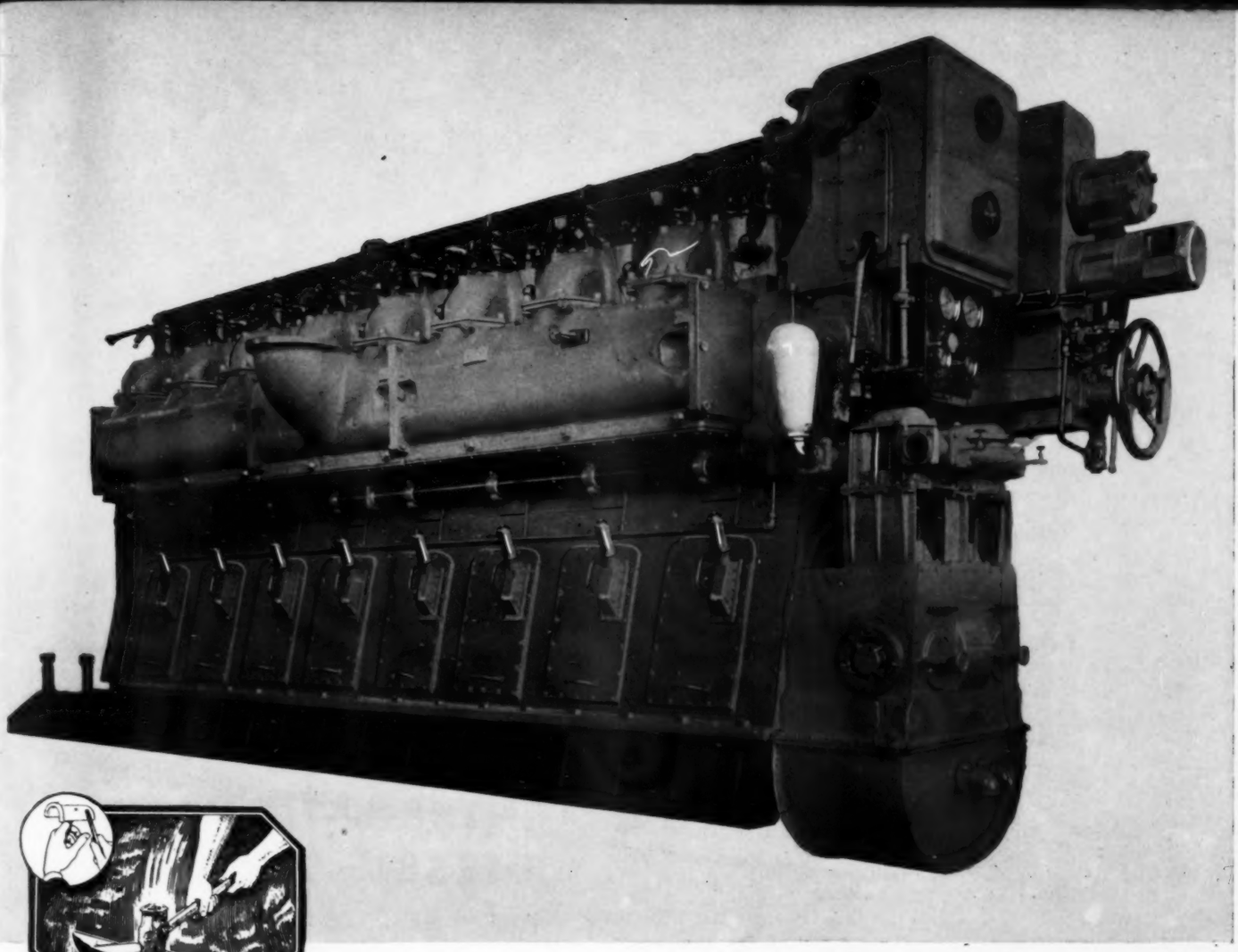
That is exactly what they found in Atlas Diesels, and that's why most of the Diesel powered shovels have Atlas engines today. The dirt moving and operating cost records of hundreds of these Atlas Diesels maintain the Atlas leadership in the powering of shovels, draglines, locomotive cranes and locomotives. When you buy a Diesel powered excavator, be sure it is powered with an engine that has proved that it can "take it."

Atlas Diesels of the Industrial Type shown at the left are heavy duty machines operating at medium speeds. They are fully enclosed and dustproof, available in 3, 4, 6, and 8 cylinder models in the following range of sizes: 45, 60, 80, 90, 120, 140, 150, 165, 200, 275 H.P.

ATLAS IMPERIAL DIESEL ENGINE COMPANY

Oakland, California · Mattoon, Illinois

ATLAS IMPERIAL



Model 8-157-A Winton Diesel engine, bore 17", stroke 26", 8-cylinder, 4-cycle, delivering 1000 hp. at 225 r.p.m. One of three units being installed at the Ludlow Manufacturing and Sales Co., Edge Moor, Delaware. These Diesels are equipped with Satco bearings.

TO THE MEN "FROM MISSOURI"

IN practically every case where Diesels have been installed to replace other types of power plants, they have sold themselves by superior performance.

In practically every case where Satco* bearings have been installed in Diesels of all types, they have sold themselves by superior performance.

Just as unseen and unsung as the men who work the hoists and lights and props for a successful stage production, Satco bearings, too, contribute mightily, behind the scenes, to superlative Diesel performance.

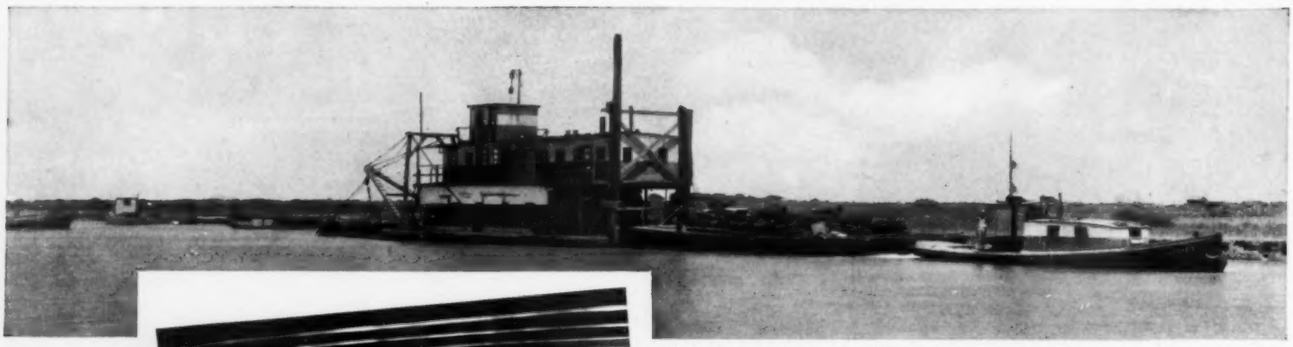
You men "from Missouri" who want to be shown hard facts and cold figures about how our Satco bearings have performed in tough jobs have but to drop us a line.

*A patented alloy manufactured by National Lead Co. Trade mark registered.

AMERICAN BEARING CORPORATION

Affiliated with National Lead Company

INDIANAPOLIS CENTRIFUGAL American Bearing FORCE **INDIANA**



Here is the tugboat, "Juliet," powered by the International Diesel Power Unit, towing the complete dredging unit weighting 1400 gross tons. The cost of towing this outfit three miles in an hour is only 10 cents.

The International Diesel Power Unit installed in the "Juliet." It requires only about a third of the space formerly occupied by a gasoline engine, and weighs only a third as much.

K. W. LINDE,

INTRA-COASTAL CANAL DREDGER

Speaks His Mind on

INTERNATIONAL DIESEL POWER

"I HAVE never seen the like of the International Diesel engine for economy. In an hour's time the *Juliet* can tow our whole dredging unit, weighing 1400 gross tons, three miles -- and do it for a dime! We have towed a supply barge with 300 tons of fresh water, fuel oil, and deck load six miles for a dime."

So says K. W. Linde, president of the Linde Dredging Co., Galveston, Texas, who has an International Diesel Power Unit in his tugboat, the *Juliet*. When it comes to Diesel power, Mr. Linde knows what he is talking about, for he has operated Diesel engines in Europe and this country since 1910.

The International Diesel operates for about a fifth of what it cost to run the 4-cylinder gasoline engine formerly used in the boat. Mr. Linde says much of this saving is due to the perfect combustion of the International. "Some so-called Diesel engines," he says, "are not able to burn the grade of fuel we use. We are fortunate in being able to buy a low-priced oil at the wells here in Texas which meets Diesel requirements. There is no smoke whatever under any load or while idling. The International is the most compact, self-contained Diesel engine I have ever seen. And it is so easy to start that we never worry about our equipment being tied up due to failure of starting equipment."

Take the experience of men like Mr. Linde as your guide in buying a Diesel. Investigate the International Diesel and find out what it can do for you. Ask the nearest Company-owned branch, or authorized industrial dealer, for information.

INTERNATIONAL HARVESTER COMPANY

(Incorporated)

606 So. Michigan Ave. Chicago, Illinois

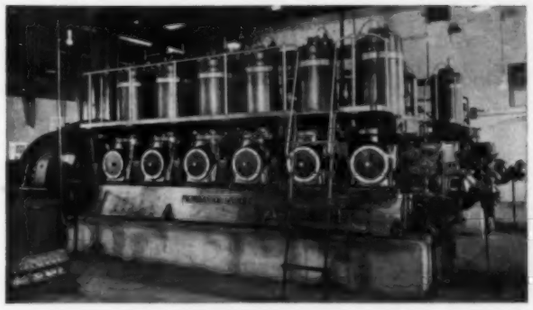
INTERNATIONAL HARVESTER

Years of Service Prove Its *Value!*

The measure of value in any lubricant is simply the cost of lubrication per hour, day, week, or other unit of service.

EN-AR-CO DIESEL OILS

not only deliver more service but BETTER service. They protect expensive parts with a margin of safety that means dollars saved by the avoidance of unnecessary wear, shut-downs and replacements. Those who have used En-ar-co Diesel Oils for many years know the real value of En-ar-co Lubrication. They know that real economy is not determined solely by the cost per gallon!



THE CHIEF ENGINEER OF A MUNICIPAL WATER WORKS IN OHIO SAYS:

"We have continuously used En-ar-co Diesel Oil for Lubrication in our two 360 Horsepower Fairbanks-Morse Engines for the past five years. This oil has given perfect satisfaction."

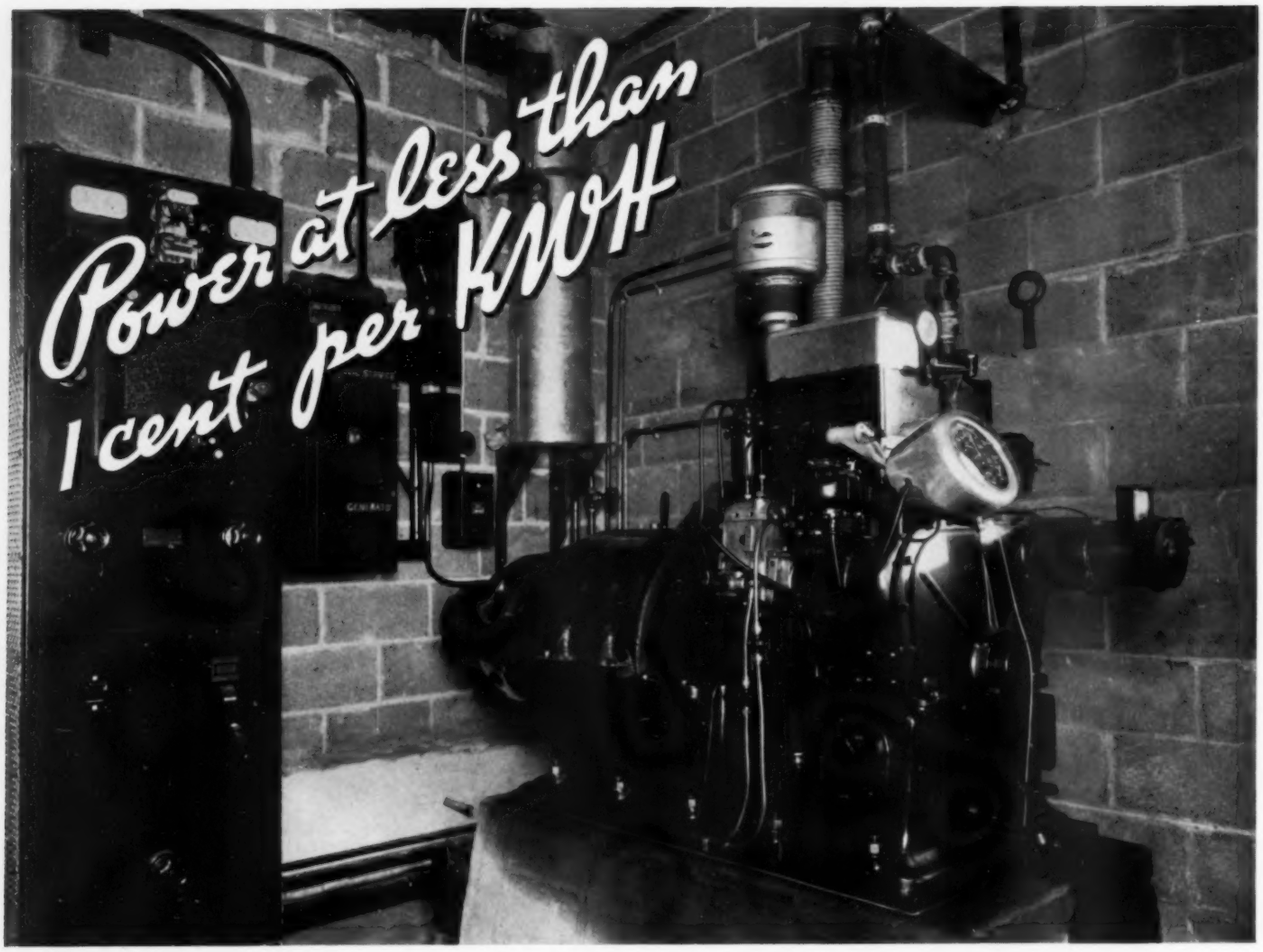
THE CHIEF ENGINEER OF A GREAT CEMENT MILL IN KANSAS SAYS:

"We have a battery of four 620 hp. Westinghouse Gas Engines, and one 1225 hp. Worthington Diesel Engine that is the power plant for the cement mill.

"In this mill and power plant we have used the products of The National Refining Company for twenty-five years, and still find its exacting requirements maintained as engineering improvement occurs."

THE NATIONAL REFINING CO.

HANNA BLDG., CLEVELAND, OHIO



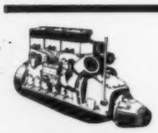
The Boulevard Restaurant Company of Camden, New Jersey, reduced its power cost to less than one cent per KWH with this Superior Diesel Electric Power Unit of 15 KW capacity.

A Superior was selected because of the reputation they have established for dependableness in the most exacting service requirements. The wisdom of this choice has been proven by uninterrupted service and low operating cost.

Any small power consumer can profit by this experience and reduce operating cost with Superior Diesels — sizes from 10 to 60 K.W. capacity.

Write for Bulletin No. JDR-535

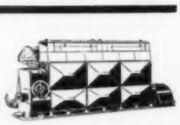
Superior DIESELS



25 to 150 H. P.

THE
NATIONAL - SUPERIOR
COMPANY
SPRINGFIELD, O. . . . LOS ANGELES, CAL.

50 to 900 H. P.



THE OTTO ENGINE WORKS . . . . PHILADELPHIA, PA.

"What is Sauce for the Goose is Sauce for the Gander"

THERE HAS BEEN NO SPARKING

FOR TURECAMO GIRLS

FOR OVER TWO YEARS

AND THERE'S TO BE NO SPARKING

FOR TURECAMO BOYS EITHER

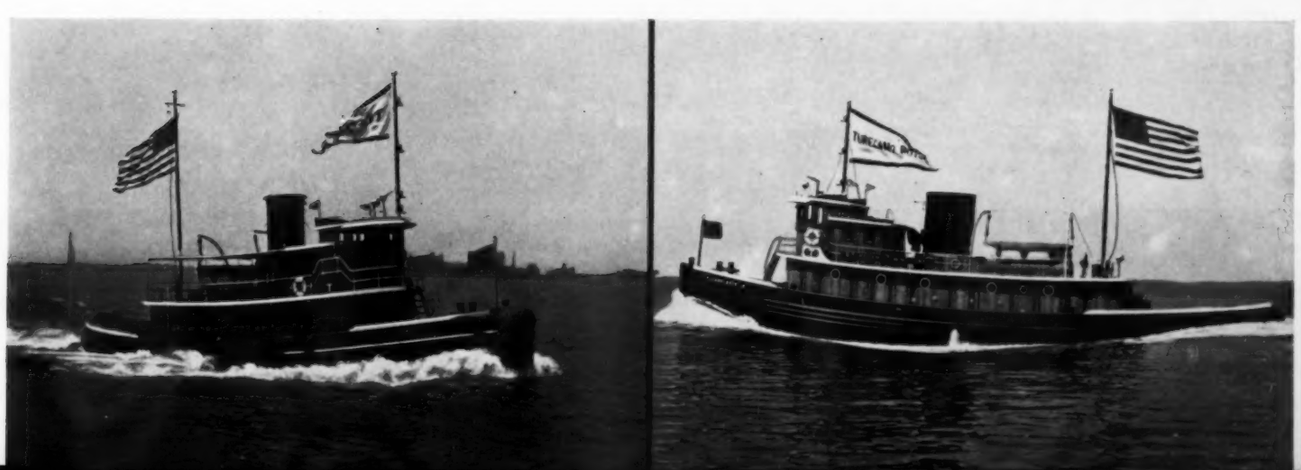
BOTH ARE EQUIPPED WITH

MODEL SC2 MAXIM SPARK ARRESTOR SILENCERS

THE MAXIM SILENCER COMPANY

HARTFORD CONNECTICUT

SALES DEPT. 50 CHURCH STREET NEW YORK CITY



WINDS AND TIDES DON'T STOP THIS GIRL

THE TUG, "TURECAMO GIRLS" is a familiar sight in New York Harbor, handling its tows steadily ... skillfully, in all sorts of weather. Her power is furnished by sturdy, reliable Winton Diesels ...and they in turn are protected by Purolator Oil Filters.

Purolator Filters... both fuel and lube... have kept abreast with Diesel progress of every character. We invite your inquiries for the type of filter that you have in mind. Motor Improvements, Inc., 365 Frelinghuysen Avenue, Newark, New Jersey, makers of

PUROLATOR

The Oil Filter

ANNOUNCING

DIESEL

APPLICATION PLAN BOOK

THREE HUNDRED AND TWENTY PAGES of plans and specifications of successful Diesel applications—a remarkable book in which have been gathered the experience, the know-how of an entire industry. From engine company files, from the leading consulting engineers of the country, from the star salesmen of the industry, we have brought together hundreds of plans of efficient Diesel plants.

Trim size 9" x 12"
Spiral binding, all pages open flat, in effect a loose leaf book

We show these plans in blue print style, white lines on a blue background. We show you the location of the main engine or engines, the location of all accessories, everything clearly defined, everything clearly demarked, then we discuss the plan, give details of the problems met and solved, explain the why and the wherefore of the engineering in each case, concisely, clearly, understandingly.

No halftones, all illustrations reproduced in line —white lines on blue background

In many instances we show profile plans of the buildings housing these plants to better visualize the type and size of buildings best suited to Diesel applications. We show groupings of accessories in a basement layout, in a gallery layout and on the main engine room floor. Every conceivable style of plant layout will be found in this book.

Edited by John W. Anderson

In these three hundred and twenty pages you will find marine, industrial, transportation and aviation applications of the Diesel engine, all in blue print form. It is our hope to provide in this book at least one plan which will approximate YOUR power requirements, so that you may visualize how simply and efficiently a Diesel application may be worked out to solve your own specific power problem.

Published by Rex W. Wadman

Ready to Mail Sept. 30th 1936—Price $5.00—DIESEL ENGINES, INC. 2 W 45th St. N.Y.C.

Again Turecamo "goes Diesel!"

The "Turecamo Boys." Launched April 22, 1936. Steel hull; length 99'8"; beam 23'6"; draft 10'6"; gross tons 240, speed 11 knots; powered by Winton Diesel engine, 600 h.p. at 350 r.p.m., 6 cylinders, 15½ x 22.

and *again* they choose the same lubricants!

There was no question as to what lubricants would be used in the Turecamo Towing Corporation's newest boat, the "Turecamo Boys."

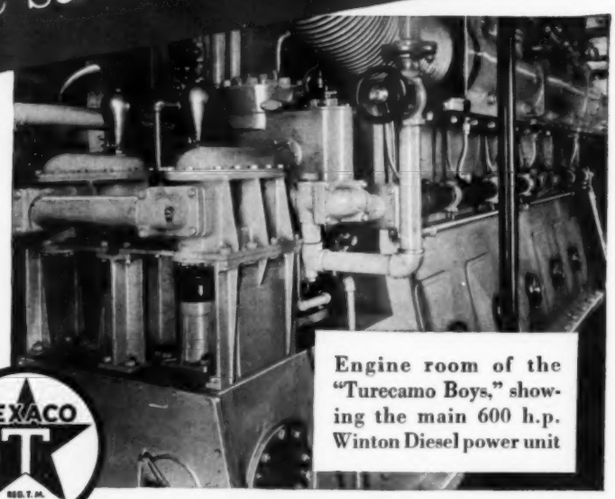
Three years ago, when its first Diesel powered tug, the "Turecamo Girls," was launched, Texaco Ursa Oils were selected and have given economical and trustworthy service.

And because of the outstanding performance of Texaco Products in its marine equipment, the B. Turecamo Contracting Company has standardized on Texaco Products for the lubrication of not only its Diesel power plant, but all other equipment as well.

No matter what type of Diesel *you* operate, you too, can get complete piston seal, which eliminates blow-by, reduces crankcase dilution, gives maximum compression, complete combustion, and greater fuel economy, with Texaco. These experiences show why *more Diesel engines are lubricated with Texaco Algol and Ursa Oils than with any other brand.*

A Texaco representative will provide engineering service to prove the economies of Texaco Products.

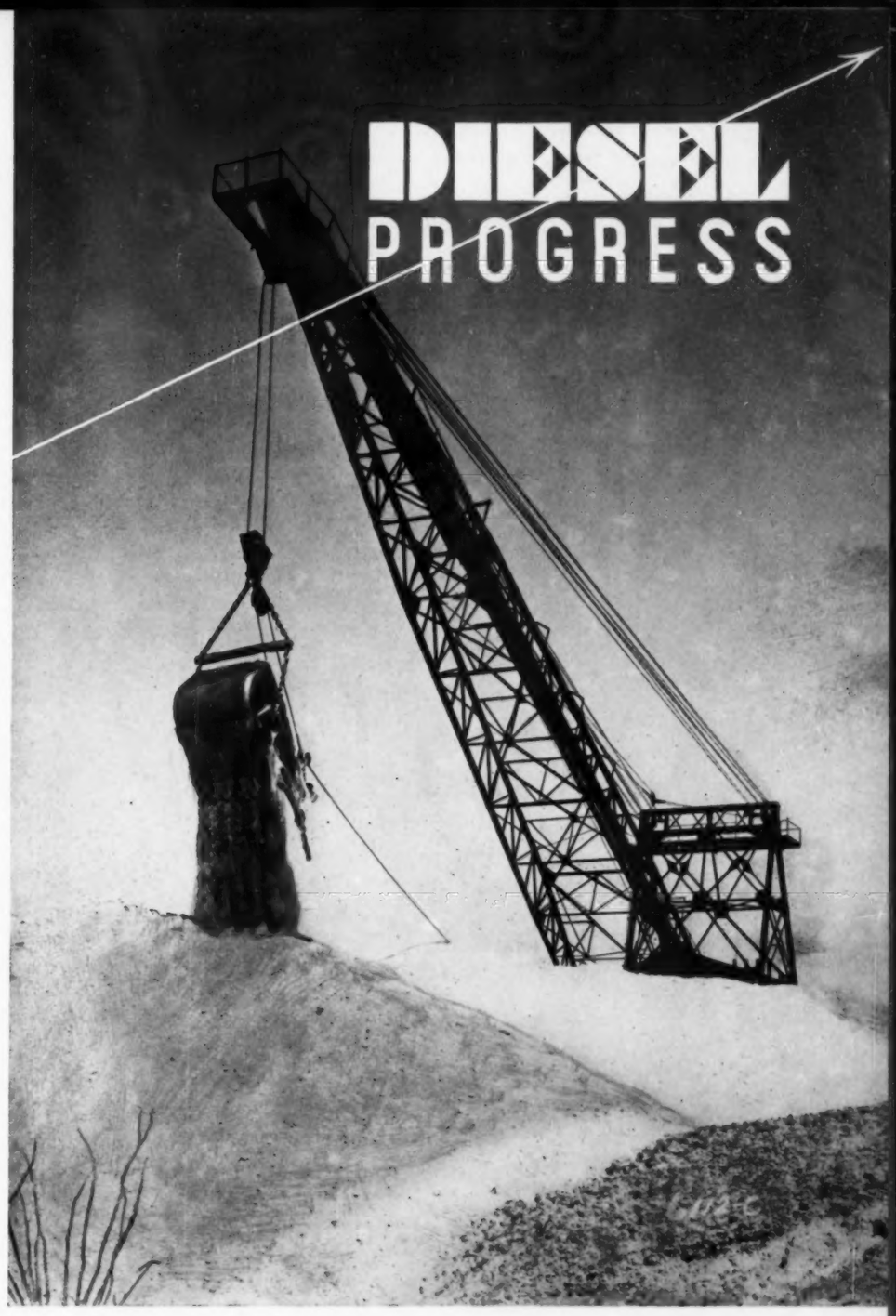
THE TEXAS COMPANY · 135 East 42nd Street, N. Y. C.



Engine room of the "Turecamo Boys," showing the main 600 h.p. Winton Diesel power unit

TEXACO

TEXACO LUBRICANTS *for all types of Diesels*



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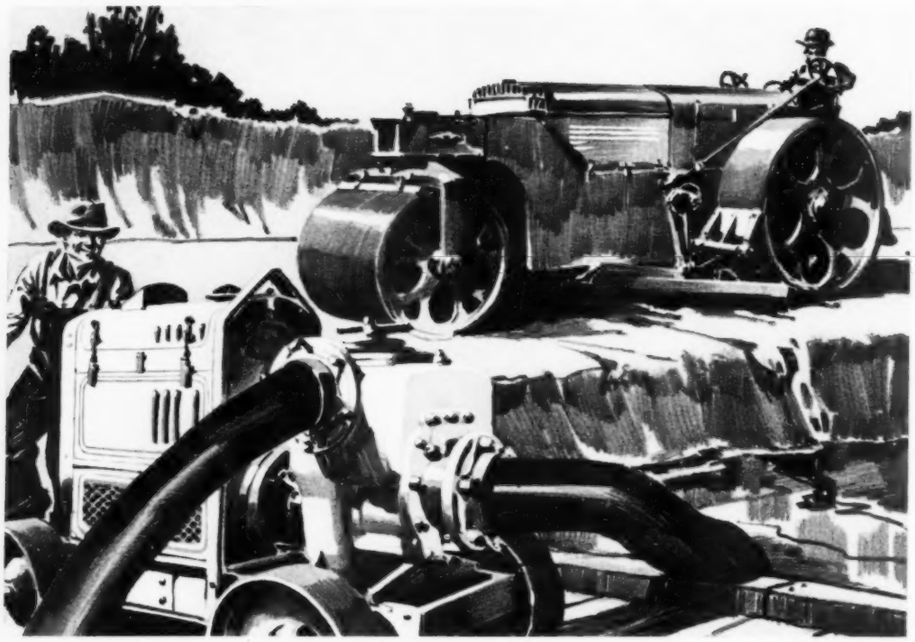
JULY

FRONT COVER ILLUSTRATION—Towboat *Turecamo Boys,* powered with Winton Diesels, described in detail on pages 18 and 19. Photograph by Morris Rosenfeld.

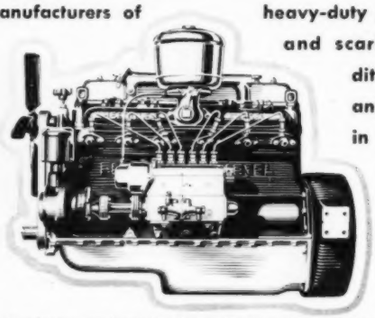
TABLE OF CONTENTS ILLUSTRATION—Bucyrus Monighan dragline powered with a Fairbanks-Morse engine working on the All-America Canal. Photo by Orville Logan Snider.

HERCULES



DIESEL ENGINES

CHOICE—Hercules offers the manufacturers of all types of heavy-duty machinery a very extensive line of finely engineered, precision-built power plants. Leading manufacturers of road building, contractors' and industrial equipment have found through the years that Hercules Engines, rugged in design and conservatively rated, give their customers exceptionally long and satisfactory service. Hercules Engines, both gasoline and Diesel, are in use in all parts of the world in heavy-duty pumps, road rollers, scrapers and scarifiers; in concrete mixers, ditchers, dredges, power shovels and compressors — as well as in heavy-duty trucks and tractors. Yearly, more manufacturers turn to Hercules for dependable power.



Hercules Marine Diesel Engines supplied by Kermath Manufacturing Company, Detroit, Michigan

HERCULES MOTORS CORPORATION, Canton, Ohio

America's Foremost Engine Manufacturer • Power Plants from 4 to 200 H. P.

DIESEL PROGRESS

REX W. WADMAN, Editor and Publisher

WHITE SULPHUR SPRINGS, W. Va., June 6, 1936. The summer meeting of the Society of Automotive Engineers came to a close here this afternoon. The Diesel Division meetings held under the aegis of S.A.E. Vice-President Fred M. Young were interesting, exceptionally so and a great deal of credit is due Mr. Young for his hard work in lining up the authors, getting everything organized and pulling off the meetings on schedule – it is a thankless task, full of headaches and few members of societies such as the S.A.E. stop to realize how hard some other members work to make these annual meetings informative, pleasant and worth while attending.

Great credit is also due the authors of papers read here this week. I particularly want to congratulate A. M. Rothrock on his paper on the effects of air flow on combustion – his motion pictures were simply marvelous. Fred M. Young's own paper on Radiators for Streamline Diesel trains was a masterpiece of careful preparation and presentation.

The Society of Automotive Engineers has done and is doing much for the Diesel Industry. It is a live, intensely active, forward looking organization and our industry will find a helping hand here. The S.A.E. appreciates the Diesel, has a splendid understanding of the future of the Diesel, hence its keen interest in current practice and its desire to work with us.

Many S.A.E. members, automotive engineers are finding and will continue to find employment within the Diesel Industry. Their knowledge of metallurgy, of strains and stresses which can be handled with the lighter alloys; the knowledge they have gained in reducing the weight of automotive engines and of automobiles, is needed in our Diesel Industry – more and more you will read of well known S.A.E. members joining the engineering staffs of our leading Diesel Engine manufacturers.

Rex W. Wadman

WORK

And what is it to work with love?

It is to weave the cloth with threads drawn from your heart, even as if your beloved were to wear that cloth.

It is to build a house with affection, even as if your beloved were to dwell in that house.

It is to sow seeds with tenderness and reap the harvest with joy, even as if your beloved were to eat the fruit.

It is to charge all things you fashion with a breath of your own spirit.

Work is love made visible.

And if you cannot work with love but only with distaste, it is better that you should leave your work and sit at the gate of the temple and take alms of those who work with joy.

For if you bake bread with indifference, you bake a bitter bread that feeds but half man's hunger.

And if you grudge the crushing of the grapes, your grudge distills a poison in the wine.

And if you sing though as angels, and love not the singing, you muffle man's ears to the voices of the day and the voices of the night.

– Kahlil Gibran – The Prophet

TURECAMO BOYS

ON June 2nd the Turecamo Towing Corporation placed into service the latest addition to their fleet *Turecamo Boys*. On the preceding day, this new member of the New York towboat fleet was on exhibit at the Battery and thousands of interested men in the marine field here in the East, had an opportunity of seeing this unique craft face to face, so to speak.

Designed by Brown and Demarest of Staten Island and built by the Rice Brothers Shipyards at Boothbay, Maine, the *Turecamo Boys* powered with a 6-cylinder Winton Diesel engine which develops 600 hp. at 250 rpm., in many respects is a duplicate of the *Turecamo Girls* which went into service in 1933. However, the new vessel is slightly larger, her length over all being 99′ 8″, moulded breadth 23′ 6″, extreme breadth 24′ 3½″, moulded depth 11′ 4½″, normal speed 10 knots, maximum speed 11 knots.

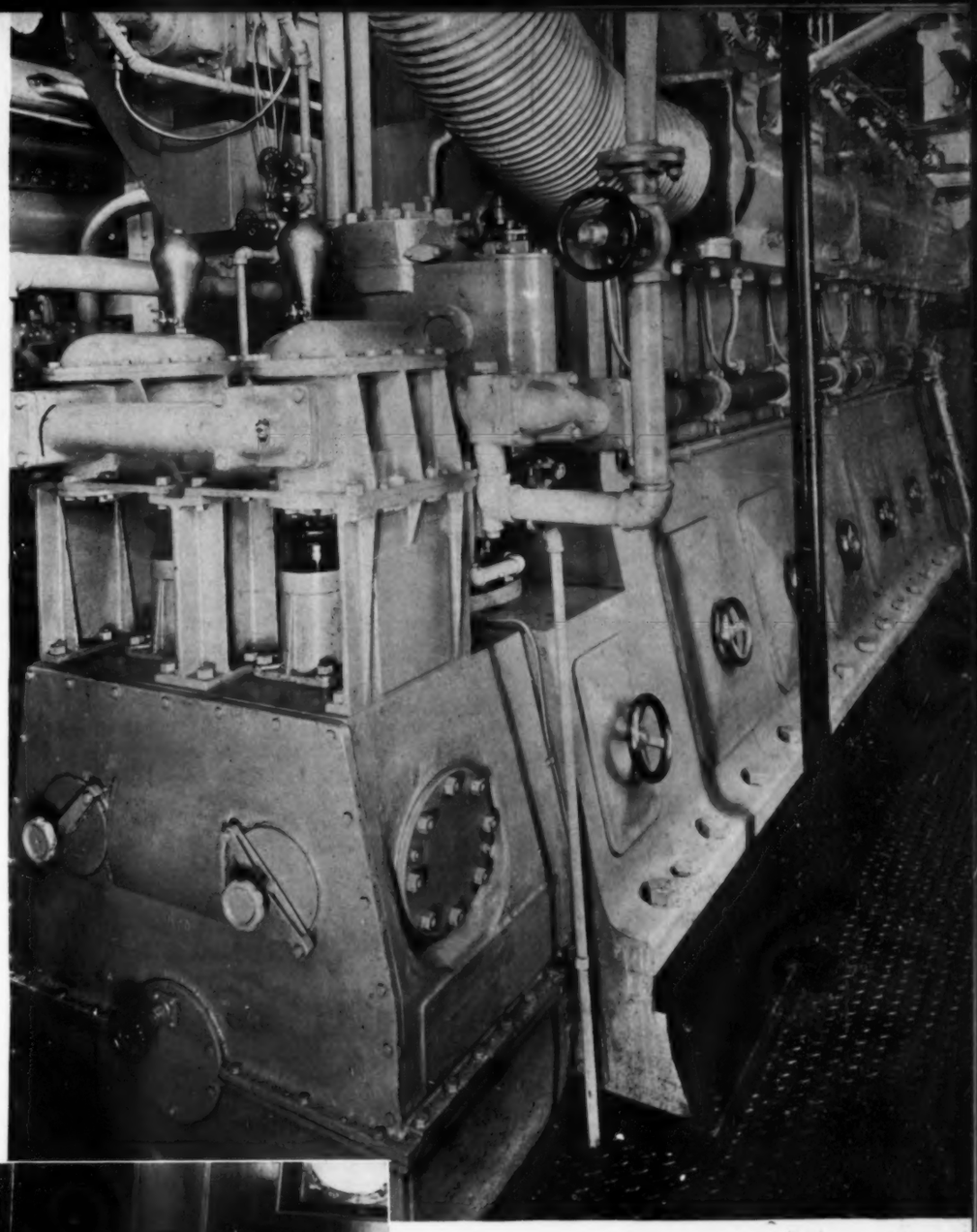
The reason for making *Turecamo Boys* slightly larger than *Turecamo Girls*, was to provide for the installation of a Babcock and Wilcox water tube boiler having 1,040 square feet of heating surface and fitted for oil burning using the same fuel as the main Diesel engine. This boiler is installed immediately forward of the main engine and the reason for this apparent "lying down of the lion and the lamb together" is that the Turecamo Towing Corporation are frequently called upon to tow oil barges, the cargo of which must be heated. Also, outside pumping facilities must frequently be used, in both of which cases steam is needed. Hence, in order to make the *Turecamo Boys* absolutely the last word in modern towboats, this combination of a Diesel engine for propulsion and a steam boiler for supplying steam for oil heating or oil pumping, was decided upon. Ample room has been given in the engine room for all of the units contributing to the successful operation of the vessel and a great deal of credit goes out to her designers, to her builders and to Mr. John Mattiello, Manager of the Turecamo Towing Corporation, who has poured into this new vessel all of his experience in towboat operation in and around New York Harbor.

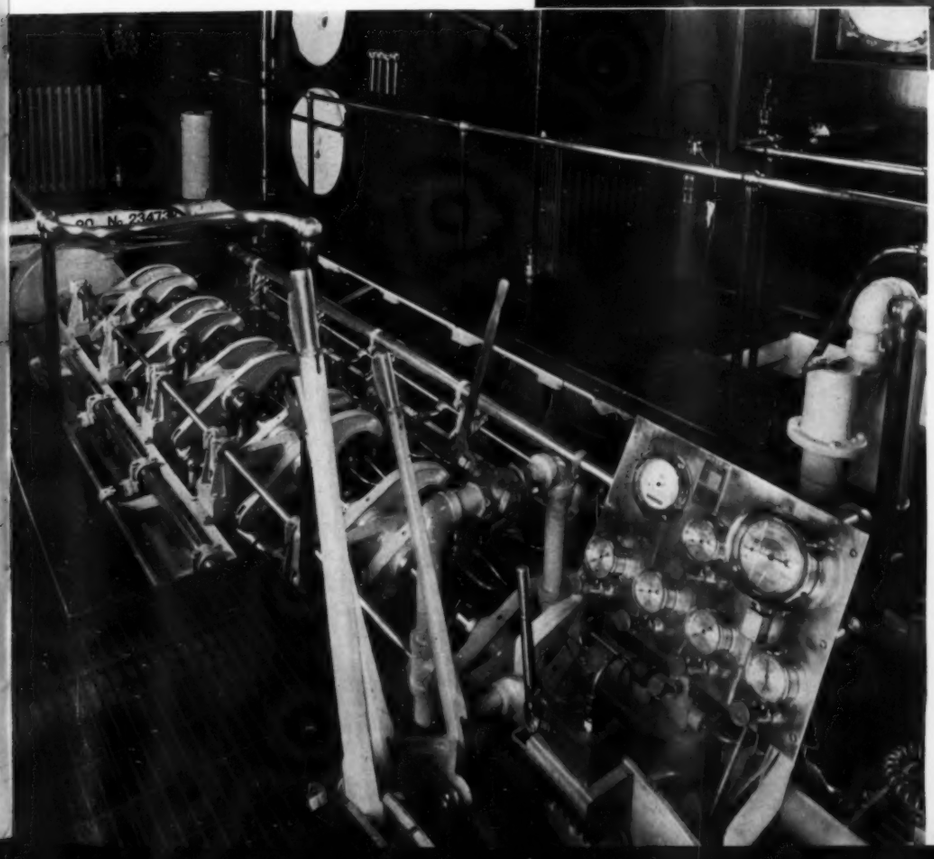
It is a well established fact that the *Turecamo Girls*, since she went into service in 1933, has created a remarkable place for herself in New York Harbor, and it is interesting to towboat owners and operators that when it became necessary or advisable to add an additional unit to the Turecamo fleet, that they practically duplicated in all essential units the boat they took delivery of in 1933. This speaks exceptionally well for the engine builders and for the designers. Just a partial explanation is found in the record of fuel costs kept over a period of months on the operation of *Turecamo Girls*. This vessel was in active operation 304 days in 1935 and turned in a splendid performance record, especially during the winter when the Harbor was filled with ice. Fuel costs for *Turecamo Girls* covering all purposes, including both galley range and a hot water and

auxiliary lighting, averaged considerably less than $1.00 an hour according to a detailed expense sheet kept by her owners.

As might be expected the auxiliary equipment on the *Turecamo Boys* is very complete. The engine room is supplied with a Reliance tachometer and Brown pyrometer; a Hydroil centrifuge, a Wright hoist, a Pneumercator fuel tank gauge, Edison storage batteries, Smith-Meeker switchboard, Purolator filters on the lube line and Sentinel filters on the fuel line. In addition to which National fuel meters are used both on the fuel line to the B & W boiler and on the fuel line to the main engine. A Maxim silencer of the spark arresting type is installed in the stack.

Outside of the engine room, possibly the most interesting piece of equipment is the electric hydraulic steering engine supplied by the American Engineering Company, and a motor driven gypsy likewise made by the American Engineering Company. The rudder is of the Simplex type made by Fore River Shipbuilding Company under the Goldschmidt patents. Most of our readers will remember that the basis of this rudder design is that it is hollow having a hydrofoil section, which not only decreases the power required for steering, but also adds to the maneuvering qualities of the boat. Very useful assets in towboat operation. The fact that a swastika is painted alongside the boat's name on the bow has caused some comment, but it is explained it is not





Views of the 600 hp. Winton four-cycle Diesel Engine taken from the upper and lower engine room levels.

the emblem of Germany, but an old Indian good luck sign that the Turecamo Towing Corporation has been using for a great many years.

Turecamo Boys is steel all over. Her superstructure is grained wood, natural finish, her interior quarters are of mahogany. Chromium plays a big part in her hardware and equipment. She is said to have a pulling strength of 24,000 pounds tied up at the dock but to have a greater hauling strength. Altogether a trim ship, well designed, well built and well equipped. She will give a good account of herself in actual service.

The new Swissair Junkers Ju 86 airliner in flight.

SWISSAIR— INTERNATIONAL EUROPEAN AIRLINE

By PAUL H. WILKINSON

FOR many years, Swissair has been noted for its up-to-date high speed transportation, using airplanes of American manufacture. At first, two Lockheed *Orion* monoplanes were used, which caused quite a sensation on account of their speed. These were followed by two of the more spacious Clark *GA-43*, which are still in service. In 1935, four of the new fourteen-passenger Douglas *DC-2* transports were acquired — large, comfortable and fast. With this equipment, a wonderful record for reliability and performance was built up, this being the fastest airline in Europe.

Early in 1936, Swissair again found it necessary to add to its fleet. New equipment was needed for the regular night route between Basle and Frankfort-on-Main due to the increased importance of the latter city as the European terminus of the Zeppelin line to South America. Although previously all its aircraft had been powered with gasoline engines, this time a Diesel-engined airplane was chosen — the Junkers *Ju 86*, of German manufacture.

Diesel engines are not new in Switzerland. An engine of this type had been built for use in trucks and automobiles, and it did not take the directors of Swissair long to decide that another logical place for the Diesel was in the air. They were aware of the many years of patient development work which finally enabled German engineers to produce reliable Diesel engines for Deutsche Lufthansa, the leading German airline. They also knew about the notable economy which could be effected by using Diesel fuel — that it cost much less than gasoline, and that the engine consumed less fuel because the energy produced by combustion was utilized more completely. Not the least important, they realized the tremendous decrease in fire hazard made possible by the use of a fuel from which the danger of explosion had been removed — a consideration of vital importance for the *safety* of their passengers, crew, mail and equipment.

Economy, efficiency and *safety* were the guiding factors, and it was thus that the twin-engined Junkers *Ju 86* was chosen — the latest product of the famous Junkers factories at Dessau. As will be seen from the illustrations, the *Ju 86* is a low-wing cantilever monoplane of all-metal construction, duralumin being used for most of the parts. It carries ten passengers and a crew of two, and has three separate compartments for mail, baggage and freight. These

compartments are located, one in the nose of the fuselage in front of the pilot's cabin, one between the pilot's cabin and the passengers' cabin, and one behind the latter opposite the toilet.

The passengers' cabin contains ten comfortable adjustable armchairs upholstered in leather. The cabin walls are carefully insulated so as to reduce the noise of the engine exhausts as much as possible. Hot air is used for maintaining an even temperature in the cabin, and the ventilation is under the control of the passengers. Access to the enclosed pilot's cabin is from the passengers' cabin. The view from the two staggered seats provided for the pilot and the radio operator is excellent, and all the instruments, including those for blind flying, are arranged so that they can be seen at a glance. There is an emergency exit through the folding windows in the roof.

The *Ju 86* can easily be converted into a freight carrier by removing the interior equipment of the passengers' cabin, and the interior covering of the cabin walls. There are no bracings to cause any obstruction and the space then available is equivalent to 152 cubic feet.

The wings are of Junkers double-section design, comprising fixed main wings and movable auxiliary wings which improve the take-off and landing performance. Ample inspection doors are provided for inspection and maintenance of the fuel tanks, fuel lines and controls. A notable feature is the use of two rudders and two fins at the extremities of the tail plane, similar to the arrangement on the Lockheed *Electra* in this country. The landing gear is retractable sideways into the wing stubs by electric motor and is lowered by hydraulic means. Hydraulic brakes are used on the landing wheels.

Power is furnished by two water-cooled Junkers *Jumo 205-C* Diesel engines placed in the leading edge of each wing. Each engine develops 600 hp. at 2,200 rpm., the total power available thus being 1,200 hp. The three-bladed duralumin propellers, built by Junkers under Hamilton Standard license, are controllable in flight. Diesel fuel for the engines is carried in four tanks in the wings having a total capacity of 296 gallons. Ordinary commercial Diesel fuel is used.

The *Ju 86* has a guaranteed cruising speed of 186 mph. at an altitude of 8,200 ft. With full load, the flight range is 870 miles, that is to say, a range of action of 435 miles. The wing span is 73 ft. 8 ins., the overall length is 56 ft. 8 ins., and the height is 15 ft. 8 ins. Empty, its weight is 12,392 lbs., the useful load is 4,023 lbs., and the gross weight is 16,415 lbs. Its rate of climb is 730 ft. per min., and it lands at 59 mph. On two engines it has a ceiling of 23,600 ft. and on one engine it can climb to 8,500 feet.

DORNIER *DO 20* FLYING BOAT TO HAVE DIESEL ENGINES

NEWS has just been received that a huge trans-Atlantic flying boat, the Dornier *Do 20,* is under construction for Deutsche Lufthansa. It is understood that it will have eight water-cooled Diesel engines, arranged in tandem pairs, inside its wings. The total power output of these engines should be at least 8,000 hp., as they are said to be of 1,000 hp. each. Each pair of engines drives a large three-bladed propeller.

The wing arrangement consists of a cantilever monoplane structure braced by struts from sponsons on each side of the hull. The gross weight is given as 128,000 lbs., which makes the power loading 16 lbs. per hp. Its wing span is 160 ft. and its speed is estimated at 180 mph.

View of the new Swissair Diesel-engined airliner on the ground

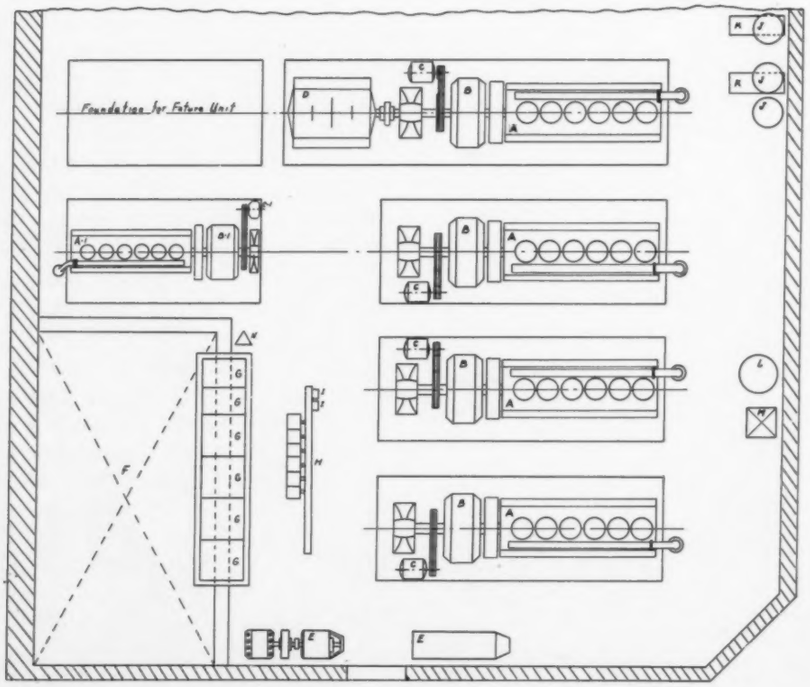
THE NAMM STORE IN BROOKLYN

By HUXLEY MADEHEIM *and*
HENRY ROSENTHAL

THE Namm Store, one of the large department stores in Brooklyn, New York, was originally supplied by the local utility with two kinds of power, alternating current and direct current, as a result of the gradual change-over from direct current to alternating current which has been in progress in New York City for a number of years. As a result of this condition and due to the fact that additions were built to the original store to provide space for expansion, the store was supplied by a total of six separate services from the local utility, three of these being alternating current and three direct current. In two cases the alternating current and direct current services were brought in at practically the same spot; in a third case there was a distance of 100 feet between the alternating and direct current

Key to Plan:

A 300 hp. Worthington Diesel
A-1 150 hp. Worthington Diesel
B 200 kw. Crocker-Wheeler generator
B-1 100 kw. Crocker-Wheeler generator
C Exciter
D Compressor
E 50 kw. motor generator set
F Fuel tank
G Day tank
H Switchboard
I Alnor pyrometer
J Starting air bottle
K Starting air compressor
L Lubricating oil tank
M Goulds Hydroil
N Cuno fuel filter



services. These three groups were separated by distances of the order of 200 feet. The direct current is used for running twenty-one of the twenty-three elevators, two of the elevators having been installed at a later date are operated on alternating current. The direct current was also used for certain pieces of equipment which had been installed prior to the change-over. This equipment was, however, of relatively small consequence as compared with the elevator load. All of the store lighting was alternating current.

From the point of view of private plant installation there could not have been a more complicated set up since the principal problem was to design a plant to supply both alternating and direct current and to tie together all of these six services and bring them to one common point where the plant might be located.

Two 250-hp. boilers made by the Combustion Engineering Company some twenty years ago and originally designed for high pressure operation were operated at low pressure for the heating system. Summer operation was also necessary in order to provide hot water.

The initial studies of this situation were not made with any preconceived idea that a Diesel plant was the most economical type of installation; in fact, the first study was made considering a steam plant. This study was quickly discarded since even in the winter less than 25 per cent of the exhaust steam could be utilized for building heating so that no considerations of possible uses for exhaust steam in the summer, such as steam jets for air conditioning could be of any interest. The reason for this condition is peculiar to department stores.

Department stores have constantly been increasing their standards of lighting; also, the increased use of elevators, escalators, and the demonstrations of various types of electric equipment have added to the electric load so that it has jumped tremendously since the beginning of the century. On the contrary, the heating load has constantly decreased due to a number of factors, among which are some of the following:

Increased heating due to increased lighting;

Increased heating due to high population loads;

Reduction of heating load due to better building construction;

Use of less windows;

Blocking off of windows with store fixtures since natural lighting is of no practical benefit in department store merchandising.

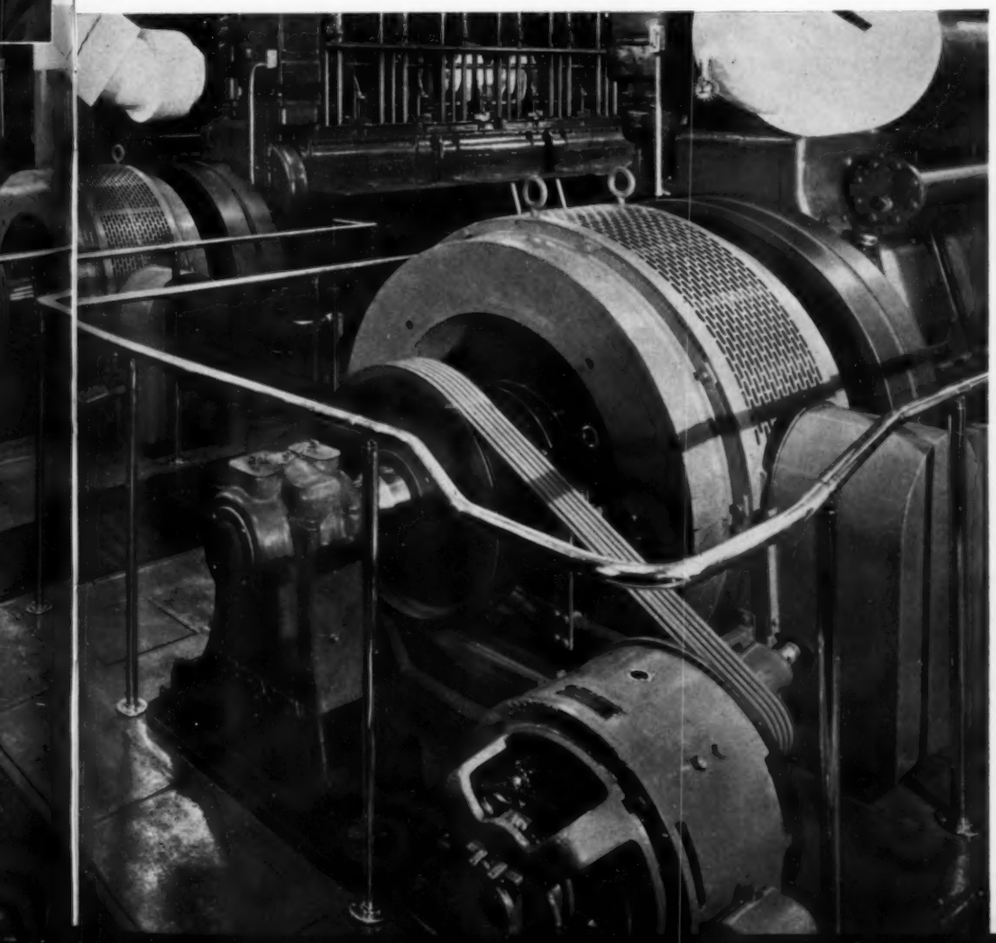
Having discarded a straight steam plant, the next study was a combination of steam and Diesel, but here it was found that steam could not be justified since, in order to count the steam unit as reserve during the summer, it would be necessary to run the boilers all summer. In addition there was the factor of complication of operation of the plant, the complication of bringing steam piping to the engine room, and the rather sensitive adjustment of loads necessary to most economically utilize the steam engine.

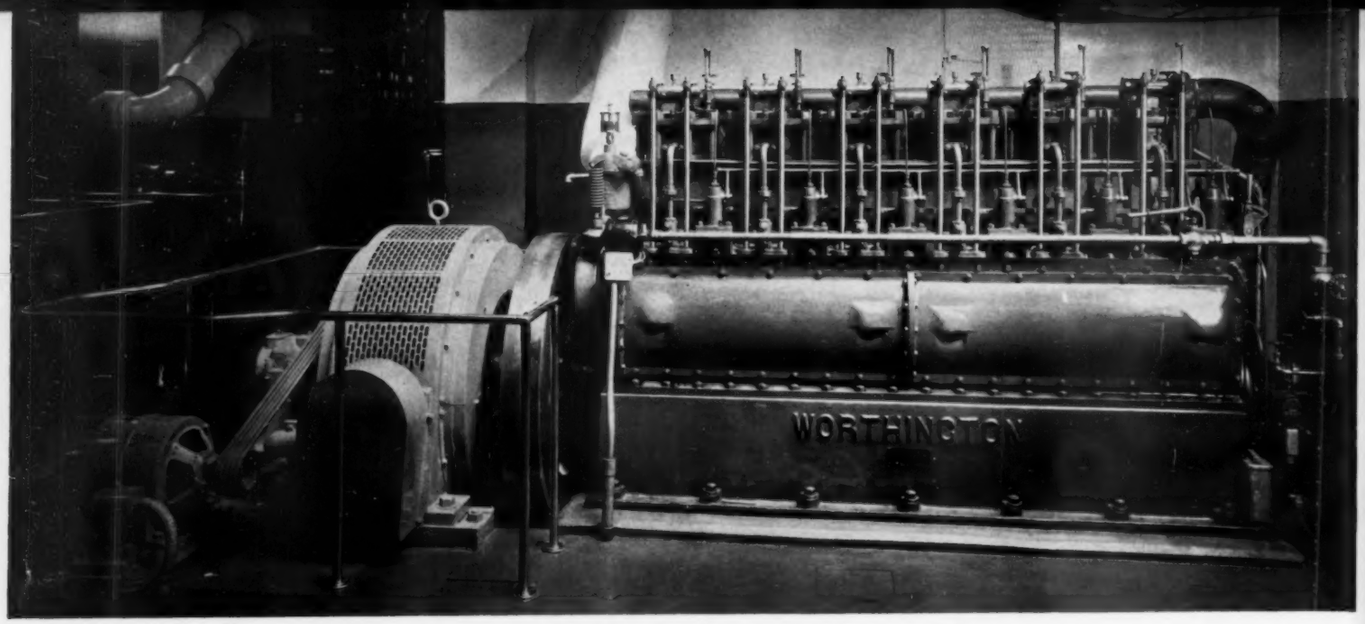
The final study made was of an all-Diesel plant which could more than supply all the domestic hot water requirements of the store, summer and winter, by using a portion of the Diesel circulating water and heating this further in water heaters through which passes the exhaust gas of the Diesel engines. Many studies were made to determine proper engine sizes, considering the sizes offered by the various manufacturers, character of the load, night conditions, etc. As a result of these studies a plant was finally determined upon consisting of four 200 kw. engines and one 100 kw. engine with immediate provision for another 100 kw. engine should the load growth, due to air conditioning, demand it. Provisions have also been made to allow for future growth of the plant should it prove necessary. The load survey indicated that except for the Christmas season the maximum load would be 700 kw. and the summer maximum would be 570 kw. without air conditioning.

The problem of handling the direct current load was taken care of by installing two 50 kw. motor generator sets, each equipped with a high slip motor with a 1½-ton fly wheel. When these sets operate in parallel the series field of one direct current generator is in series with the armature of the other to insure equal load division. It has been found on test that with a kilowatt load fluctuating from 10 kw. to over 100 kw., with an average of 36 kw. that these fluctuations are transmitted in a very diminished manner from the direct current side back to the alternating current side.

The problems that have been solved in this plant are listed on the following page:

Below: View of engine room looking from switchboard. Left: Huxley Madeheim who, with his associate, Henry Rosenthal, engineered the Namm installation.





The 150 hp. Worthington Diesel. Provision has been made to add a second unit of this capacity when load increase justifies it. (See plan.)

1. Vibration has been reduced to below the point of normal vibrations occurring from street traffic and other equipment so that no one is conscious of any vibration, and it can be detected only by extremely sensitive measurements.
2. All exhaust noise has been eliminated.
3. There is no flicker whatsoever in the lights.
4. All of the equipment was installed in existing basement space with very little disturbance to store operations.
5. Many miles of steam piping, water piping, electric conduits, telephone cables, and drain lines were removed and re-routed from the space elected for the engine room so that there is nothing now in the engine room requiring maintenance, except engine room equipment, thus eliminating the necessity for disturbing the normal operation to make repairs to other equipment.

All five engines are 6 cylinder, 4 cycle, solid injection Worthington Diesels. The larger units are 300 hp. with 10¾-inch bore and 14½-inch stroke, direct connected to 200 kw. Crocker Wheeler generators driven at 400 rpm. The smaller unit is 150 hp. with 8-inch bore, 10½-inch stroke, operating at 514 rpm. All have Bosch injection pumps. The larger engines are equipped with Woodward governors but the smaller engine has a Pickering governor. Should oil or water temperature become excessive or should oil or water pressure fail, an alarm system operates. Each cylinder is provided with a thermo-couple which indicates the exhaust gas temperature on two Alnor pyrometers located on the main switchboard.

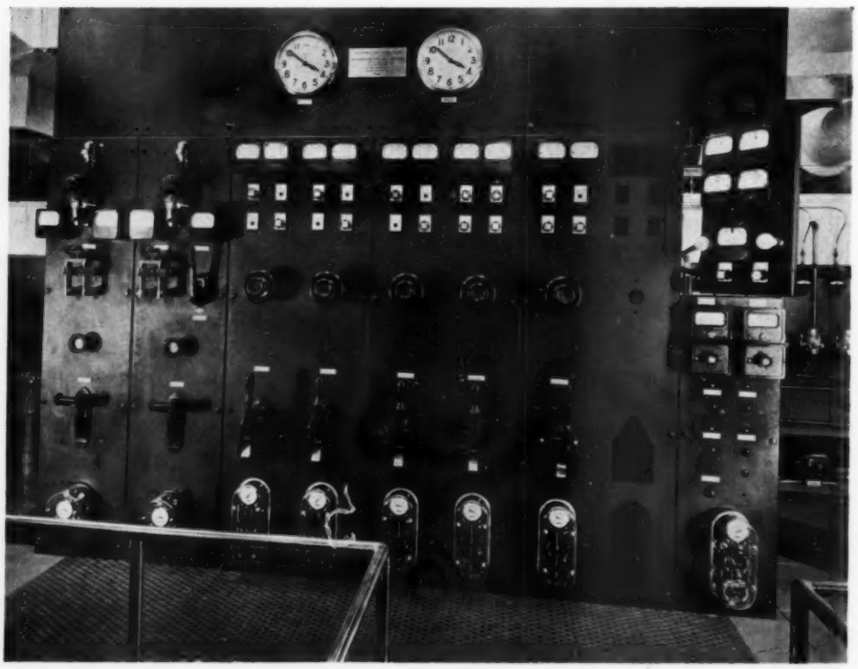
Fuel oil is stored in a rectangular tank of 13,000 gallons capacity divided into two compartments, housed in a brick room with access space all around it as required by the New York Building Code. Each of the large engines has its own 98-gallon day tank; the one for the small engine has a 64-gallon capacity. One hand and two electric pumps are provided for pumping oil from the storage tank to the day tanks. Oil to each day tank is metered separately and individual tank level gauges are provided at the valves controling flow of fuel.

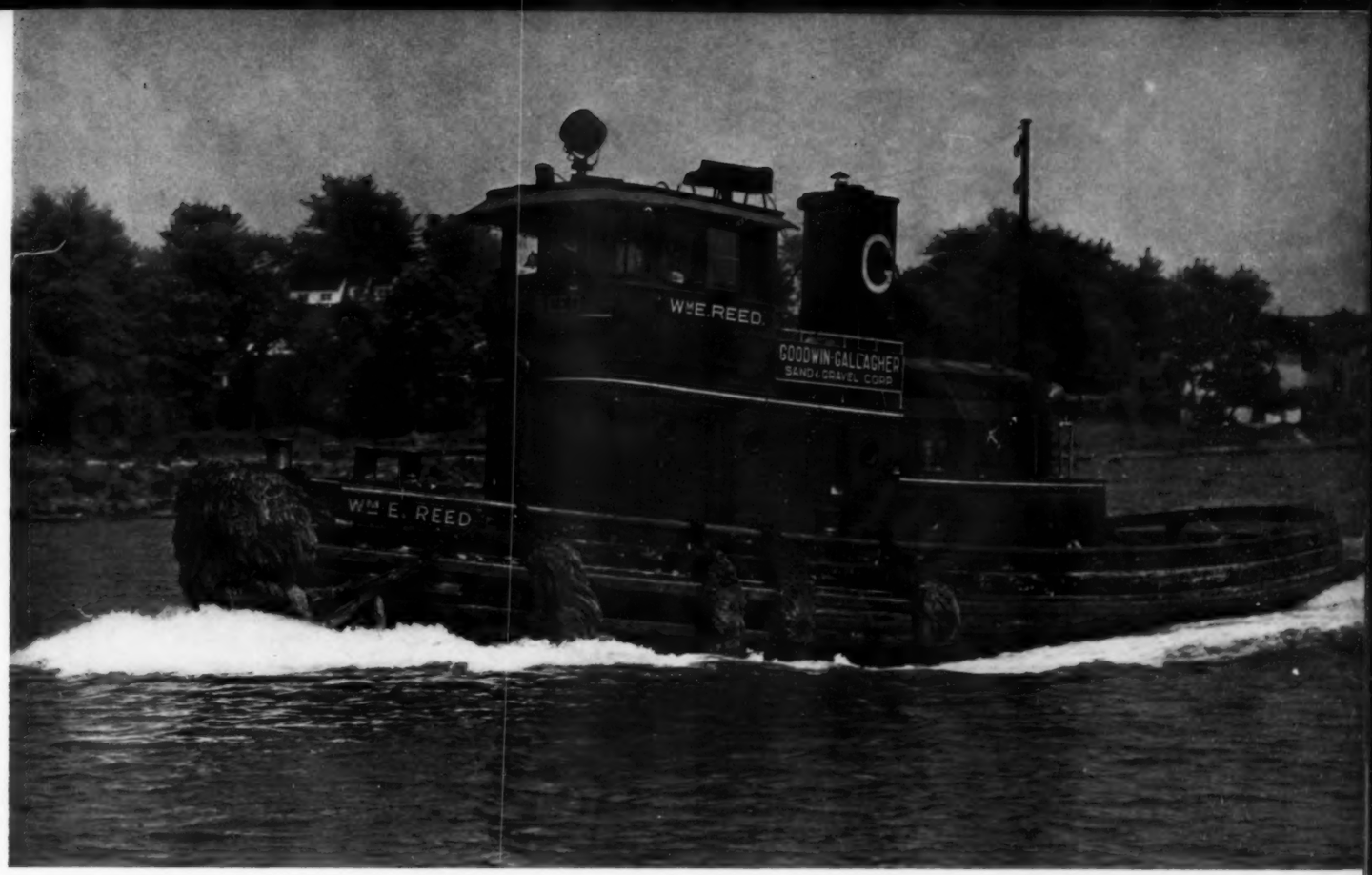
Clean lubricating oil is stored in an overhead tank of about two barrels capacity and piped to each engine crankcase. Each crankcase can be drained to a floor sump of about 2 barrels capacity from which a Hydroil centrifuge delivers clean oil to the clean oil tank.

Engine exhausts are carried separately for about 100 feet and are then connected to a 30-inch manifold which joins a 30-inch spring supported steel stack housed in a brick chamber. Space between the brick chamber and the stack is used to exhaust air from the engine room. The top of the stack has a Maxim silencer. In addition, each separate exhaust from three of the engines has a Maxim silencer.

. . . . *And now please turn to page 47*

View of switchboard showing the two Alnor pyrometers. In the background may be seen two of the fuel meters and the motor driving afuel transfer pump.





The 240 hp. Diesel tug Wm. E. Reed now in her eleventh year of active service

DIESELS BRING SAND AND GRAVEL TO MARKET

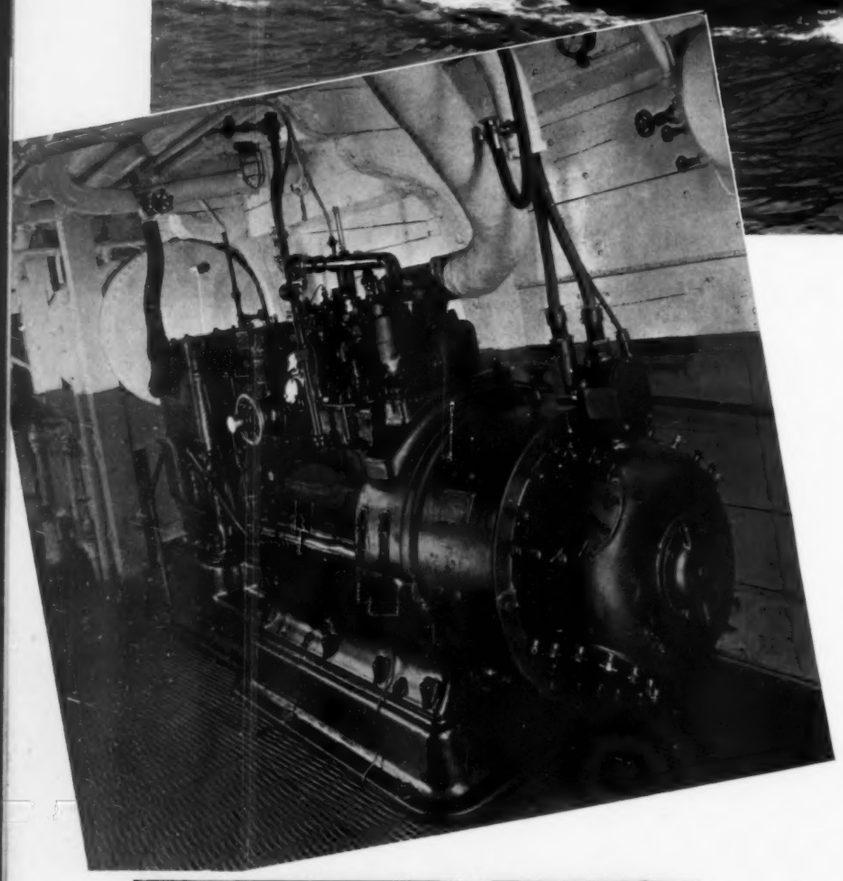
By E. SCHOONMAKER

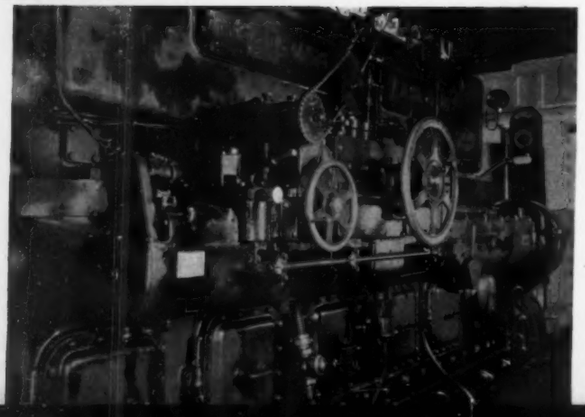
A GLIMPSE of New York's skyline reveals the greatest concentration of sand and stone within the smallest space ever known. It is the well known fleet of Colonial Sand and Gravel trucks which daily supplies the ingredients to New York's major building operations. It is not unusual for this company, the largest concern of its kind, to deliver as many as 60 barges in a day, each with a capacity of approximately seven hundred cubic yards. The Colonial Sand & Gravel Company's subsidiary, the Goodwin-Gallagher Sand & Gravel Co., handles the quarrying and waterway transportation of the product, while the parent company takes care of its distribution.

Today the Goodwin-Gallagher fleet consists of six Diesel tugs, the flagship being the *Gene Pope;* others are *Catherine Pope, Wm. E. Reed, Colonial, Gene Jr.* and *F. R. Pope.*

Towing and shifting loaded and empty sand barges is an every-day occurrence—yet it is a costly task unless tugs are operated with Diesel engines. Although Goodwin-Gallagher built their Diesel fleet during boom times, they have found it an extremely profitable investment throughout the depths of depression. Twelve years ago the first Diesel engine was installed in the newly built shifting tug *Gene Jr.* formerly the *Zack.* It was the well known C-O, a two cycle engine which became very popular because it not only withstood a lot of hard usage, but was very economical. Although outmoded by later style two cycle engines, hundreds of these C-O's are still serving tugboat operators faithfully. The query, "What is the life of a Diesel?" may be likened to the phrase, "How High Is Up?" With prior steam experience Goodwin-Gallagher figure that each of their Diesel engines pays out its first cost from savings in less than five years.

The waterways are the main arteries of transportation between far-flung sand pits and distributing stations on the Sound, rivers and harbors. A constant supply of sand and gravel must be ever on its way to supply the market demand. Therefore, a system of shifting, hauling and delivering scows has been worked out. This keeps four big Goodwin-Gallagher Diesel tugs working twenty-four hours a day, 365 days a year. The shifting tug *F. R. Pope* at Northport averages half this time, while the *Gene Jr.*





"Gene Pope," flagship of the Goodwin-Gallagher fleet, and two illustrations of her engine room showing main and auxiliary Diesels.

at Port Washington is again working twenty-four hours a day. During the course of these night and day operations, all the hazards of navigation have to be faced. These tugs with heavy tows must traverse treacherous waterways like Hell Gate; must also cut traffic lanes through the ice of Long Island Sound, where winds and tides must be allowed for. The constant, steady, dependable power of the Diesel engines meets every emergency that the Goodwin-Gallagher fleet encounters.

The schedule under which these tugs operate does not permit many wasted moments. The work at hand keeps each boat on the jump, which activity would be considerably slowed up if coal and water had to be loaded for steam requirements. Time lost between jobs, awaiting orders does not total an hour a day on any of the tugs. Loading fuel for the Diesel engines is an hour's job, which ranges from once every seven days on the *Colonial* to once every forty-five days on the flagship *Gene Pope*. No time is lost in starting these engines – they are equally quick on the reverse, which is accomplished through centralized engine controls.

Diesel success is not measured entirely in terms of flexibility and reliability. There is another

important consideration – "operating economy." The records kept by the Port Engineer, Mr. Henry Bade, show the following average operating costs on an hourly basis:

Tug	H.P.	Combined Fuel and Lubricant Hourly Cost
Gene Pope	700	$1.42
Catherine Pope	360	.85
Wm. E. Reed	240	.60
Colonial	150	35.
Gene Jr.	100	.31
F. R. Pope	60	.07

For the sake of comparison on a more comprehensive basis, as between steam cost and Diesel Fuel Economy, the following records of two Goodwin-Gallagher tugs, of almost equal horsepower, should prove interesting to all tugboat operators:

Month	Fuel Cost Steam Tug "Phoenix" 280 hp. Engine	Fuel Cost Diesel Tug "Catherine Pope" 360 hp. Engine
January	$891.74	$85.47
February	736.95	193.11
March	861.14	108.81
April	817.21	133.21
May	663.84	199.26
June	629.89	300.48
July	588.32	158.17
August	860.85	216.42
September	787.90	149.63
October	766.46	167.40
November	518.56	112.97
December	158.40	105.40
Total	$8,281.26	$1,930.33

In spite of the fact that the *Catherine Pope* did more work, her operating expense was less by a ratio of better than 4 to 1, with fewer delays in refueling.

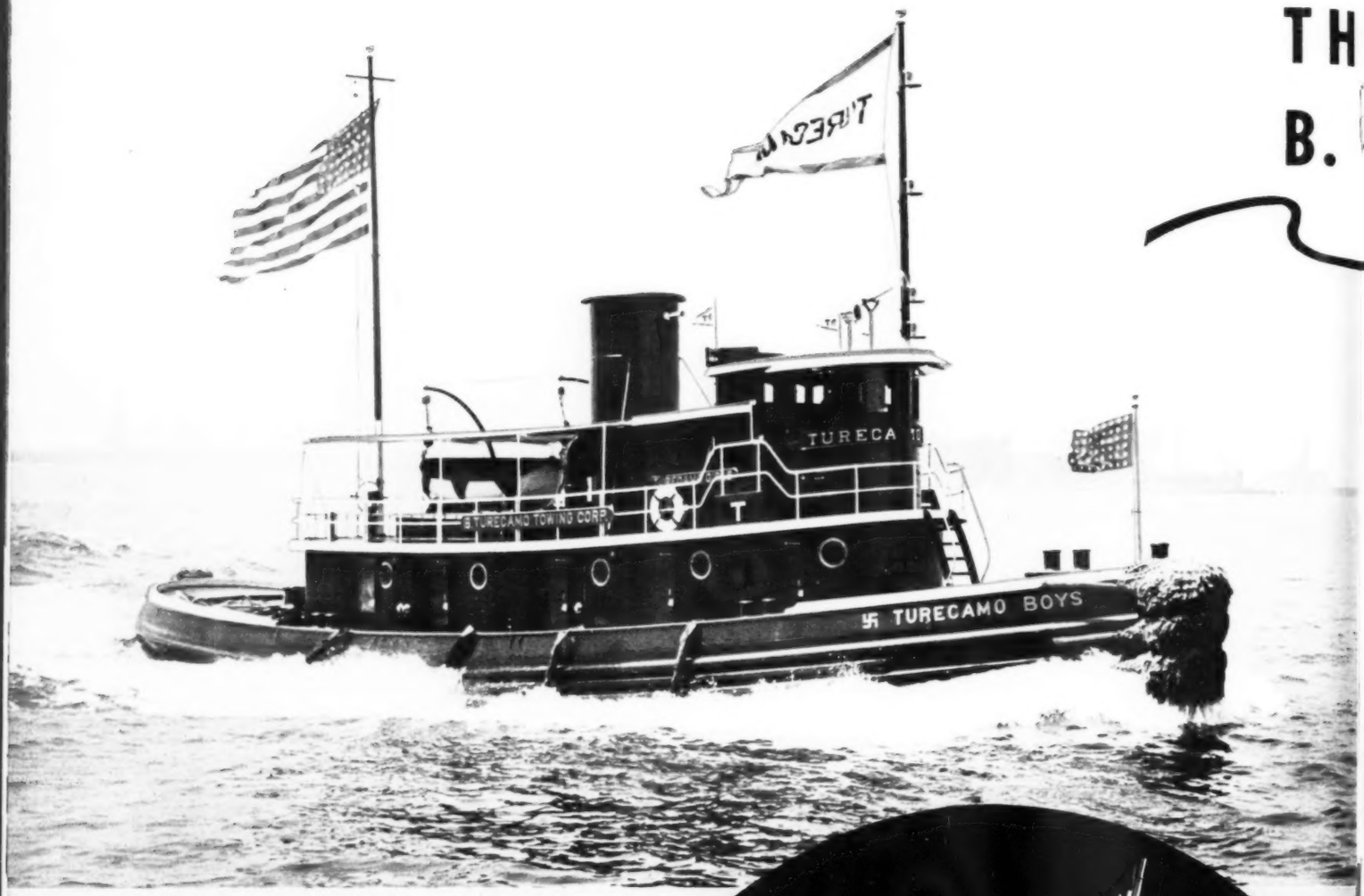
. . . . *And now please turn to page* 52

Twenty-four hour service since 1927 is the record of "Catherine Pope." She has amply tested the reliability of her 360 hp. Diesel.

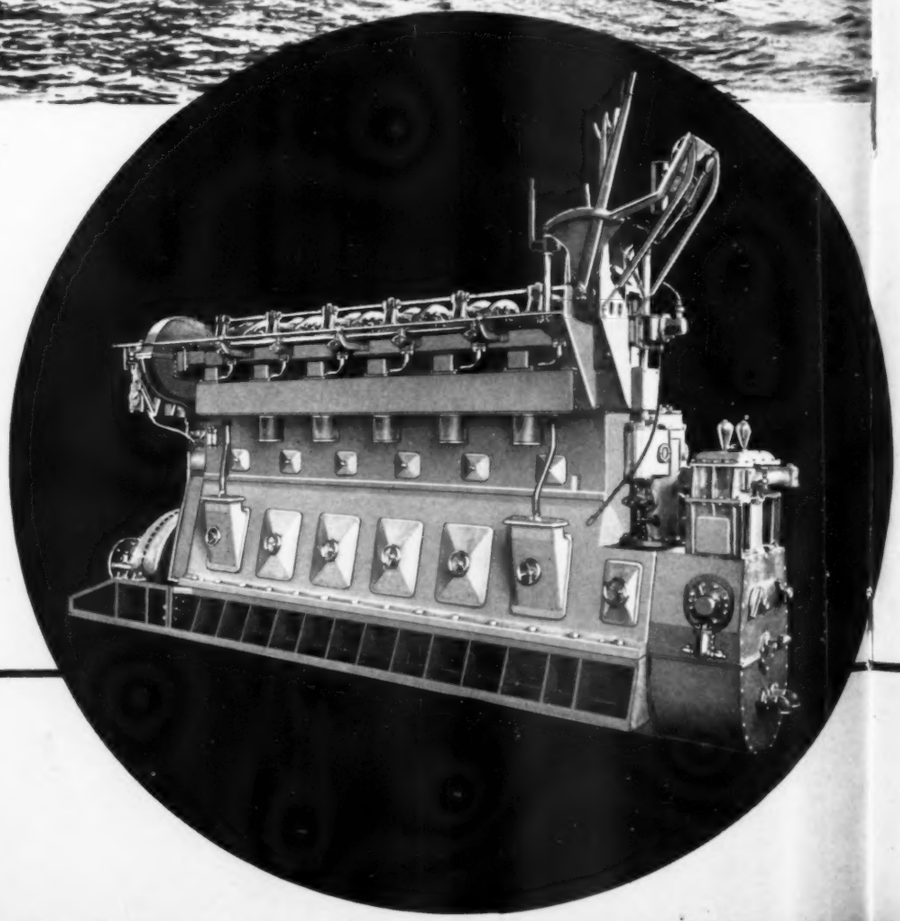
Gene Jr. Diesel shifting tug handles as many as forty-five such scows a day

The Colonial can't take time out even for a coat of paint

THIS
B. Tu



Six-cylinder, 600 b.h.p. Winton-Diesel engine installed in the new workboat *Turecamo Boys*



Symbol of Economy and Dependability

THIS TIME IT'S *"Boys"* AT THE B. Turecamo Contracting Company

The B. Turecamo Contracting Company, Brooklyn, N. Y., placed their first Winton-Diesel workboat, *Turecamo Girls*, in service some three years ago. Since that time this boat has distinguished itself by its outstanding performance and economy in operation. The owners will shortly place in service their second Winton-powered towboat, the *Turecamo Boys*, a duplicate of the *Turecamo Girls*. The new tug, 93 feet in length, was designed by Merritt Demarest and is being built by the Rice Bros. Shipyards, Boothbay, Maine. It is powered with a six-cylinder Winton-Diesel engine developing 600 b.h.p. at 250 r.p.m. . . . demonstrating again that given the opportunity to prove their superior performance characteristics, economical and dependable Winton-Diesel engines are invariably specified by the owner for installation in subsequent craft to carry his name.

WINTON ENGINE CORPORATION

CLEVELAND, OHIO, U. S. A.

LONDON LETTER No. 8

By GEORGE LIND

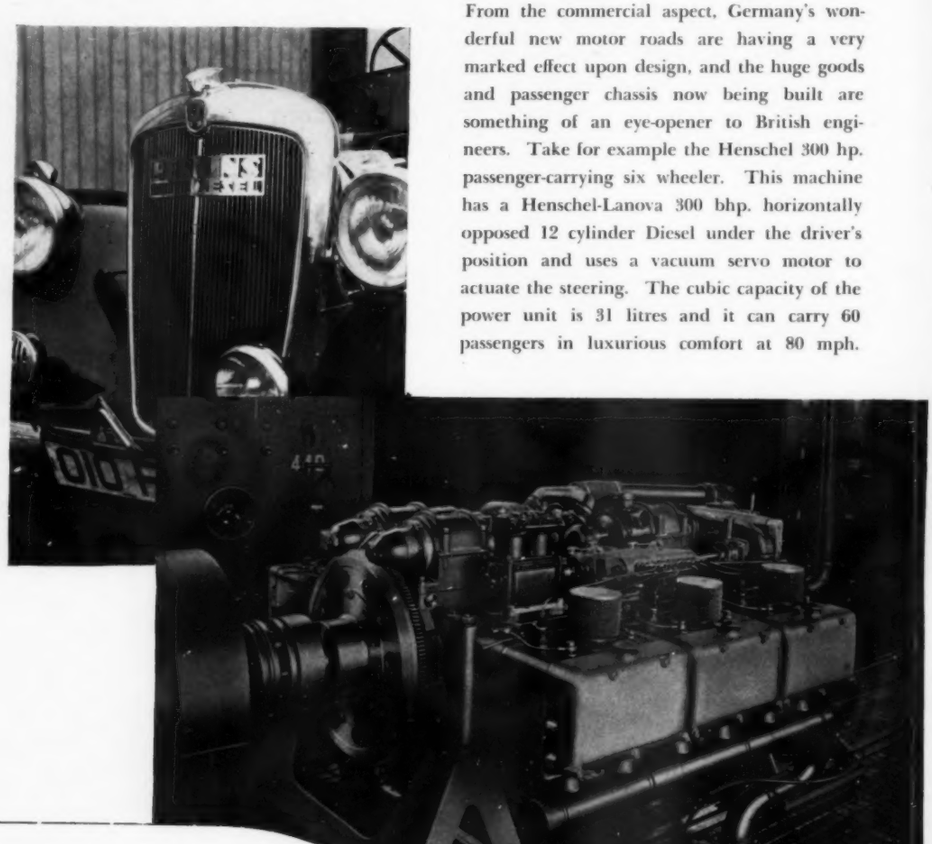
SINCE last writing on Diesel road transport matters in these columns some highly interesting developments have occurred on this side of the Atlantic. Six months ago, with the exception of the little Coventry Victor horizontal twin, the smallest successful transport Diesels were all machines of some 2½ litres capacity. Now, however, at least three European manufacturers are experimenting with 1 to 2 litre engines, and one, the German Hanomag Company, has actually produced a complete engine-chassis assembly for a 1½ litre private car which by the end of this year will be in full production.

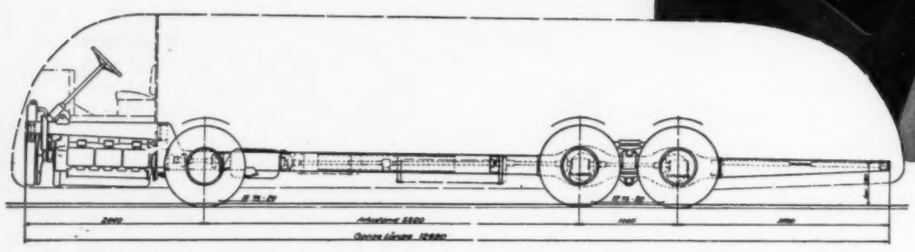
The Hanomag motor is a 4-cylinder with a 64 mm. bore and 74 mm. stroke, the swept volume being 1,660. The combustion system is of the ante-chamber type, the fuel atomisers spraying into small subsidiary combustion chambers located in the cylinder head. The injection gear is made by Bosch and push-rod operated overhead valves are used in conjunction with aluminium pistons, hardened steel cylinder liners, and a five bearing crankshaft. A governor is fitted to the fuel pump, the maximum speed being 3,500 rpm., at which 32 bhp. is developed.

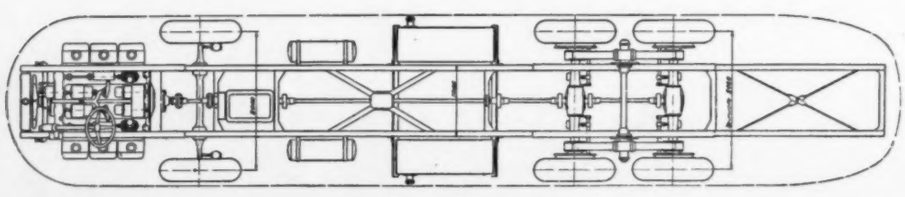
For the particular chassis in which this engine is fitted a single plate clutch and 4-speed syncromesh gearbox is employed, the front wheels being sprung independently and the rear by means of long semi-elliptics. The chassis, incidentally, is identical with the normal petrol engined job and complete with 4-seater saloon body weighs 23 cwts. As regards performance, the maximum speed, using a 4.55 to 1 back axle ratio, is just over 50 mph., 10 to 30 mph. taking some 15 seconds in third gear.

The first public view of the Hanomag Diesel-engined chassis was at the Berlin Motor Show in February—a show, be it noted, which proved beyond doubt the Diesel's ascendancy in Germany. In the commercial vehical section of this exhibition no fewer than 14 of the total 23 manufacturers showed oil-engined chassis, and of that total 10 firms announced that they would only fit petrol engines to special order! In the main automobile hall, too, the Diesel was well represented, as apart from Hanomag. Daimler-Benz also showed a range of extremely smart 4-cylinder 2.6 litre independently sprung oil-engined cars.

From the commercial aspect, Germany's wonderful new motor roads are having a very marked effect upon design, and the huge goods and passenger chassis now being built are something of an eye-opener to British engineers. Take for example the Henschel 300 hp. passenger-carrying six wheeler. This machine has a Henschel-Lanova 300 bhp. horizontally opposed 12 cylinder Diesel under the driver's position and uses a vacuum servo motor to actuate the steering. The cubic capacity of the power unit is 31 litres and it can carry 60 passengers in luxurious comfort at 80 mph.



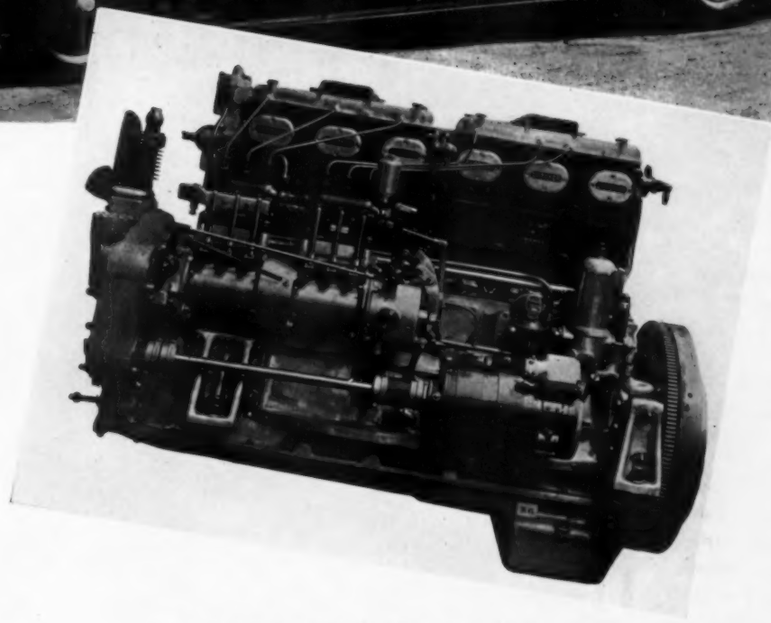




The neat nameplate on a Morris-Perkins conversion. The Henschel-Lanova engine and the chassis layout of the 300 bhp. Henschel bus. A truly remarkable piece of design.

Already there are several of these machines in service, and by reason of their sound design and accessibility for maintenance work they are proving ideal for arduous long-distance express routes.

In England, development with smaller types of engines has been almost as rapid as on the Continent, and, although no manufacturer has yet standardized a Diesel-engined car, the number of conversions on the road is increasing steadily. As regards performance, at any rate, the British engines are superior to any yet produced, and are already running the petrol motor very close. To illustrate this point two recently completed tests may be cited, the engine used in each case being of standard manufacture and free from specialized finish or tuning of any sort.



A typical Daimler-Gardner bus; clean, businesslike and efficient, fitted with a 104 bhp. six-cylinder Diesel, pre-selecter gearbox and fluid flywheel.

Below, are the performance figures for a conversion made by the Pelican Engineering Co. of Leeds, the car in question being for use in Australia. The engine employed is a 4-cylinder Gardner unit of 3.8 litres capacity weighing about 8 lbs. per bhp. and developing 83 bhp. at 3,200 rpm.

Make of Car: Humber Snipe 4-seater saloon
Normal power unit: 3½ litre 6-cylinder petrol engine

Maximum speed: 80.36 mph.

Petrol consumption: 16-18 mpg.

Acceleration times (4.54 to 1 axle ratio):
10 to 30 mph. in 3rd gear 7.2 secs.
10 to 30 mph. in top gear 10.8 secs.
30 to 50 mph. in top gear 12 secs.

Fuel cost: 2 cents per mile

Gardner 4 L K engine: 3.8 litre 4-cylinder Diesel

Maximum speed: 83 mph.

Fuel consumption: 38-44 mpg.

Acceleration times (3.5 to 1 axle ratio):
10 to 30 mph. in 3rd gear 9.6 secs.
10 to 30 mph. in top gear 13.8 secs.
30 to 50 mph. in top gear 12.8 secs.

Fuel cost: ½ cent per mile

It is intended to cover 35,000 miles of Australian roads in the year with this car. At home prices this means the fuel cost is estimated at 182½ shillings as against 730 shillings if it had its original petrol engine. The Diesel will not need to be decarbonized during this time either, so that the net saving should be well over 560 shillings.

The second set of data relates to Captain George Eyston's specially designed saloon racing car fitted with a standard 8.85 litre 130 hp. 6-cylinder oil engine of exactly the same type as used on the London buses. The track life of this machine is well over 2 years now, yet since its construction in 1933 it has consistently improved upon its performance until February of this year, when it took its last batch of long-distance records at Montlhery track near Paris.

The following are the records it now holds:

50 kms.	98.751 mph.	6 hrs.	98.445 mph.
50 miles	101.24 mph.	12 hrs.	98.053 mph.
100 kms.	101.82 mph.	3,000 kms.	96.053 mph.
100 miles	102.95 mph.	24 hrs.	94.990 mph.
200 kms.	103.21 mph.		
200 miles	103.12 mph.		
1 hour	103.01 mph.		
3 hours	48.794 mph.		
500 kms.	98.823 mph.		
500 miles	98.296 mph.		

In addition, it has covered the flying mile at 120.335 mph., although this speed has since

The A.E.C. engined saloon racer at speed with Captain George Eyston at the wheel. The insert illustration was taken at Brooklands after a record attempt.

been exceeded by Captain Eyston's new car Flying Spray, fitted with an experimental Air Ministry engine.

An interesting point about the A.E.C. saloon is its fuel economy, and even with heavy taxes the fuel cost of a run of 100 miles at 100 mph. is no more than 1 shilling. Despite the high speed at which all the records were taken, the engine ran so cool that it was possible to lubricate it with one of the thinnest oils – Castrol AA.

Apart from private car conversions large numbers of 2½ to 3½ litre Diesels are now in use on light high speed trucks and coaches and are saving their owners many pounds in reduced fuel bills and maintenance costs. Here, again, the conversion experts are to the fore, the number of makers building their own small transport Diesels still being limited.

One exception to this rule is the old and much esteemed firm of Leyland, of Leyland, Lancashire, who are now producing one of the neatest engines on the market. It is a 6 cylinder unit of 3½ in. (88.9 mm.) bore and 5 in. (127 mm.) stroke, the swept volume being 4,731 c.cm. The power output at 2,200 rpm. is 71 bhp. and the engine complete with flywheel weighs 1,040 lbs.

Constructionally the Leyland "Light-Six," as it is called, follows normal practice, the valves being located vertically in the head and operated by push rods from a 4 bearing nickel steel camshaft. The cylinder head is a single clean casting and carries the atomisers and all valve gear. Aluminium alloy 4-ringed pistons are used, rifled drilled "H" section steel connecting rods, with the top halves of the big-end bearings made of high duty aluminium alloy, and the bottoms of white metal, being also employed in conjunction with a hardened steel 7-bearing crankshaft.

A noteworthy point is the combustion system, the design of which is exclusively Leyland. The ante-chamber is spherical in form and is connected to the combustion chamber proper by a tangential throat. In order to obviate the need for loose pieces half of the spherical ante-chamber is machined in the head and the other half in the block. On the compression stroke of the piston a rotary air swirl is created in the spherical ante-chamber by the displacement of the air from the cylinder to the chamber.

A very neat truck fitted with a 6-cylinder Leyland "Light-Six" engine. Insert — Four-cylinder Daimler-Benz Diesel engined car. This is a 6-seater saloon, with independent springing all around.

The resultant proper mixing of fuel and air ensures complete combustion.

Of the externally built power units two of the most successful are the sturdy little 2.75 and 3.9 litre Perkins Wolf and Leopard engines. This concern has taken up the production of transport engines in real earnest and their output figures have been rising steadily for the last 12 months. Among the many commercial vehicles makes standardized or fitting Perkins engines to order are such names as Albion, Dennis, Commer, Dodge, Reo, Studebaker, Thorneycroft, Muadslay, Bedford and Foden, in addition to which conversions for Ford V8, Hillman, Morris 16 and 20, Studebaker and Vauxhall are also available.

From the hundreds of letters of appreciation from Perkins' customers one remarkably illuminating example must be given here. It is too good to be overlooked.

Samuel Morgan, Ltd.
Blue Line Coaches, Armthorpe

Dear Sirs,

Your engines are putting up such a remarkable performance for us that their value from an investment point of view is just too surprising, as they say in the United States.

We have two Gilford 32-seater buses fitted with Perkins "Leopard" engines, both giving excellent service. We put our first Leopard-engined vehicle into service on 1st May, and up to 23rd October it had done 35,000 miles. This represents 73,000 miles per year showing comparison with a petrol engine.

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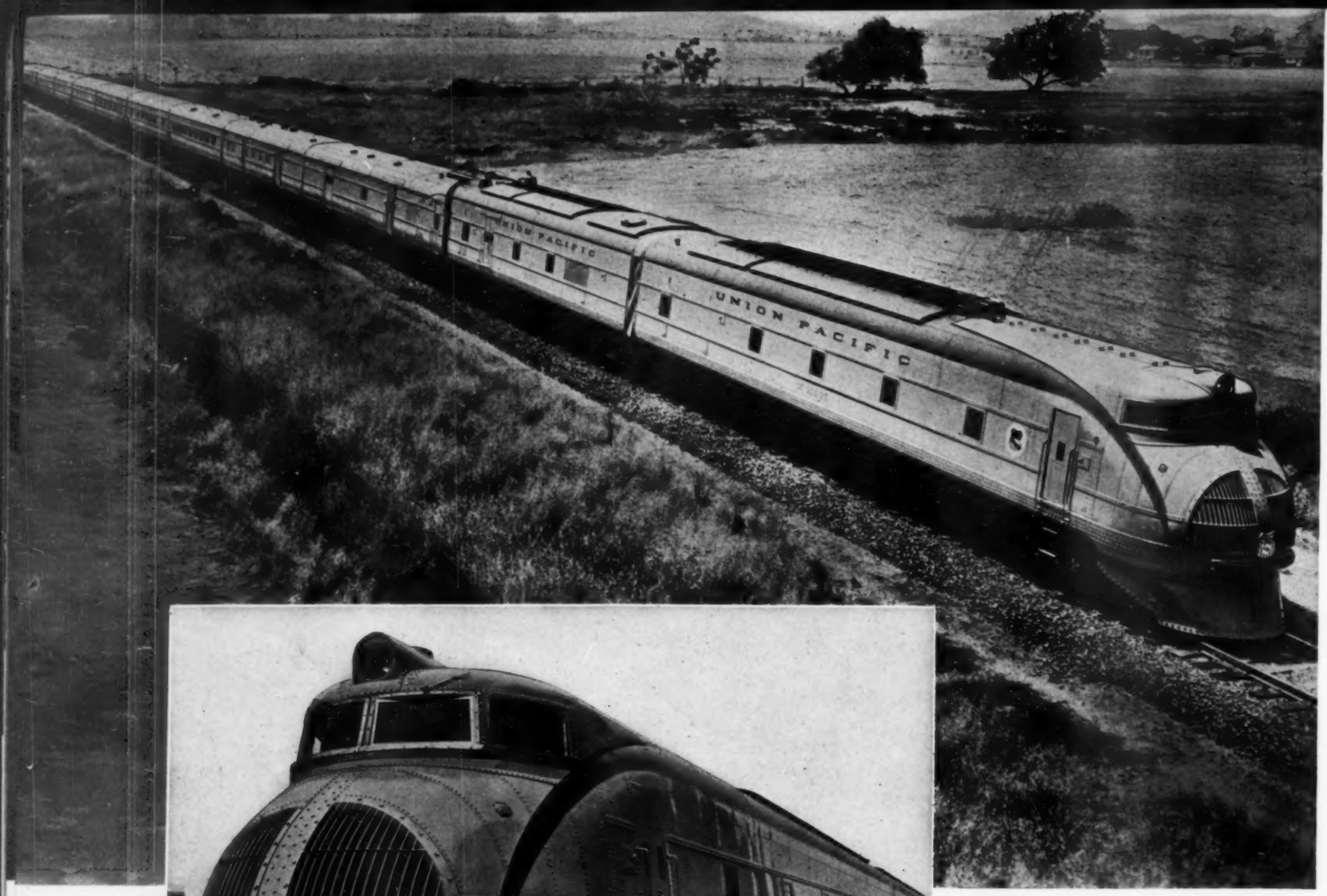

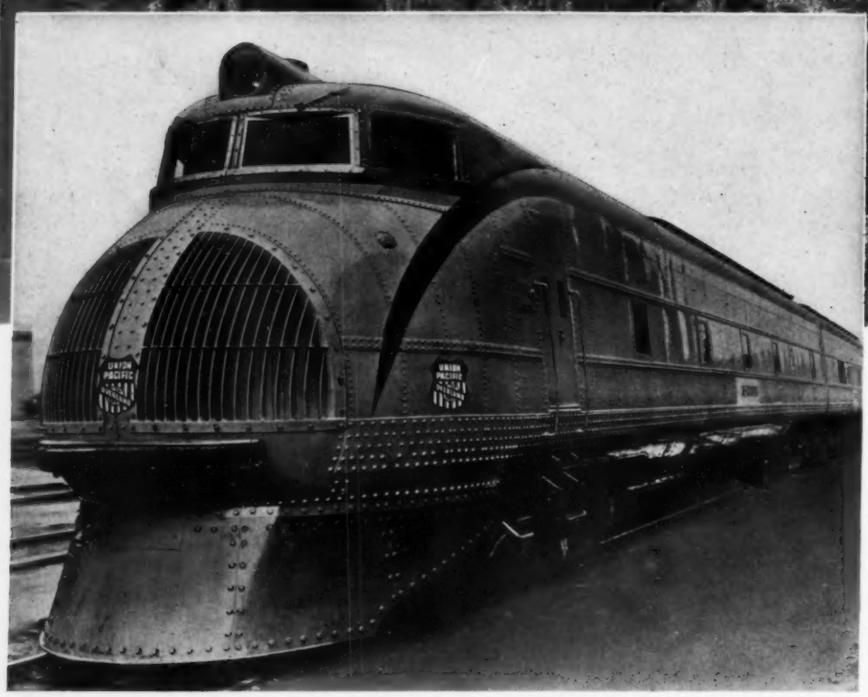

DIESELS SAVE NINETEEN HOURS

FOR years the dream of railroad men and travelers alike has been a one-business-day service between Chicago and California. The new high speed, light weight locomotive Diesel has transformed that dream into everyday reality with two trains now operating on regular schedules of 39 hours and 45 minutes. The first of these, the Santa Fe Super Chief rolled out of Dearborn Station, Chicago, promptly at 7:15 P.M. (C.S.T.) on the evening of May 12, 1936, on the first scheduled run to Los Angeles under or even close to forty hours. At exactly 8:59 A.M. Thursday morning, the second day following, the Super Chief drew into the Los Angeles Station with a capacity passenger list one minute ahead of her schedule which only a few years ago would have been termed impossible.

The breadth of public interest aroused by this dramatic advance in railroad service was quickly evidenced to those on the train. Crowds, at times numbering into the thousands, were gathered at cities, towns and even wayside crossings all the way across Kansas, Colorado, New Mexico, Arizona and into California. Naturally, at these spontaneous gatherings the big 3,600 horsepower Diesel locomotive hauling the heavy train at such extraordinary speed was the focus of all eyes.

The top speed attained on the westbound trip was 102 mph. reached between Joliet and Shopton, and the first 992 miles out of Chicago were covered in exactly 892 minutes requiring an average speed of 1.11 miles per minute.

The Super Chief's return to Chicago was marked by the same clocklike regularity of performance which distinguished the west-bound journey. With La Junta reached on time to the second and the mountains all left behind,

the Super Chief raced eastward down the gradual grade to Kansas City. It is on one portion of this track, a stretch known as the Santa Fe "Race Track," that the fastest sustained speed either east or westbound is made. The regular eastbound schedule here calls for 324 miles at an average speed of 81 mph. The final run into Chicago was taken in stride by this great Diesel locomotive and the round trip was completed with seven minutes to spare.

Since a complete technical description of the Super Chief was given in the October, 1935, issue of DIESEL PROGRESS, let us now turn to the second Diesel train in service between Chicago and California.

The Union Pacific System has just received two new streamlined Diesel trains of nine articulated sections each and a two-unit locomotive. These are known as M-10002 or "City of Los Angeles" and M-10004 or "City of Portland" and were designed to introduce faster, safer and more comfortable trans-continental service between Chicago and the respective cities whose names they bear. The M-10002 was placed into competitive service with the Super Chief on May 15 and maintains a similar schedule of 39 hours and 45 minutes from Chicago to Los Angeles. The two-unit Diesel locomotive supplies 2,100 hp., 1,200 being generated by the forward unit and 900 by the second section. The Diesel-electric equipment was furnished by the Electro-Motive Corporation, the engines of course coming from the Winton shops in Cleveland. The construction of the train proper is of aluminum alloy except for cast steel trucks and a few miscellaneous steel castings. The trucks are especially light and strong and despite the terrific speed of this and similar trains it is reported that track maintenance is actually less than with the old type.

The "City of Los Angeles" is 714 feet long and weighs 503 tons loaded with all supplies ready to run. The nine articulated units behind the two locomotive sections (which are detachable) consist of a mail-baggage car, a baggage-dormitory-kitchen car, a diner-lounge car, four sleeping cars, a deluxe coach and a coach-buffet car. While these are all practically of standard width, a reduction of over two feet in the height gives a considerably lower center of gravity. This, in addition to special truck design and the new articulated construction, provides vastly improved riding qualities at all speeds. To increase further the comfort of transcontinental passengers, the entire train is air conditioned. The M-10002 can accommodate 84 passengers in the sleeping cars and 86 in the coaches making a total of 170. Each seat is numbered and reserved in advance so that the train capacity is never exceeded.

Thus one more Diesel triumph is added to an already imposing list as American rail transportation moves forward to new records.

The Super Chief on its premier westbound run speeding through Cajon Pass and its arrival at the new Santa Fe station, Pasadena, California.

DIESEL TRACTION IN ITALY

By ANTONIO GIORDANO

THOUGH Diesel traction was adopted in Italy before the war on the Ferrovia dell'Appenino Centrale from Arezzo to Città di Castello and Fossato di Vico, and on the so-called Ferrovie Salentine, an extensive employment of Diesel engines for traction purposes has not been made until last year, when not only the Italian State Railways Administration but also several private concerns as the Società Italiana per le Strade Ferrate del Mediterraneo of Milan and the Santerno Anonima Ferroviaria of Imola (central Italy) decided to give preference to the Diesel for the operation of certain services. The Italian State Railways Administration, after the employment of the petrol rail cars on their lines, discovered that such type of cars could not meet the requirements of short trips on lines with gradients and consequently studied the problem of the employment of the Diesel traction. The result of such research work has been so successful that it resulted not only in an order for 50 Diesel-powered rail cars to the Società Anonima Italiana Ernesto Breda at Milano, but also in an order for 25 special Diesel-engined rail cars provided with restaurant service to the same company, and in an order of 9 Diesel-engined streamlined trains to the Stabilimento Grandi Motori Fiat of Turin. The cost of this rolling stock is about 25 million lire. The structure of the new railway rolling stock of the Italian State Railways Administration is

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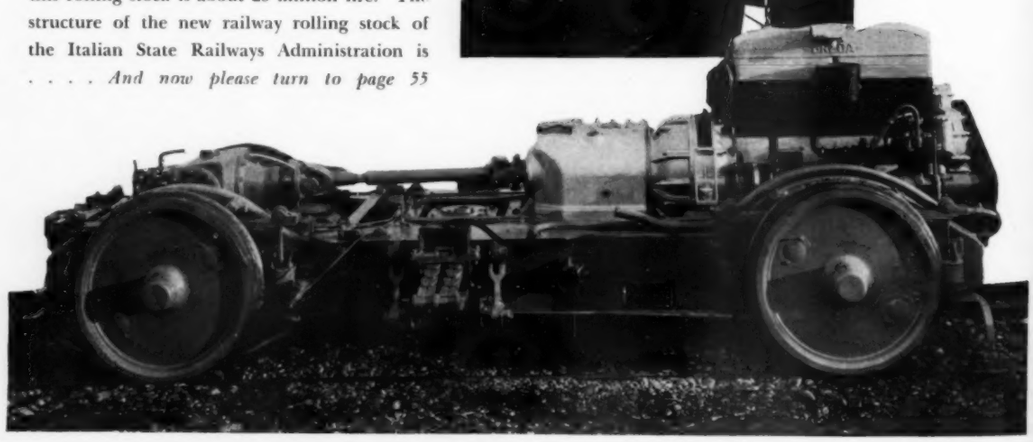
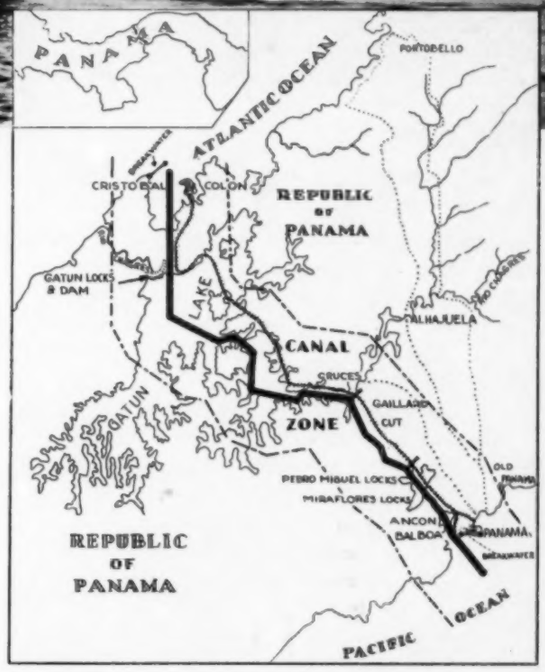


The Breda Diesel rail car on trials before a committee of French railway experts. Also the driving platform and details of the truck engine mounting.

The new 750 shp. Ingersoll-Rand Diesel tug "Arraijan" in service on the Canal.



CANAL ZONE DIESELS

DESPITE the large number of huge construction projects undertaken by this country during the past few years, the Panama Canal still retains its rank as one of the world's foremost accomplishments in this field. Twenty-two years have elapsed since it was placed in service and still the "Big Ditch" continues to hold its glamour. Lord Bryce once characterized it as "the result of the greatest liberty man ever took with nature." Unfortunately, the canal is out of travel range of most of us, but it is not surprising to find that American Diesels have been rendering faithful and economical service there for almost ten years and that two new Diesel-electric tugboats are being added to the government fleet of service vessels.

In classifying the various makes, types and sizes of Diesel engines now delivering power in the Canal Zone it is essential that the reader understand the subdivisions of governmental administration:

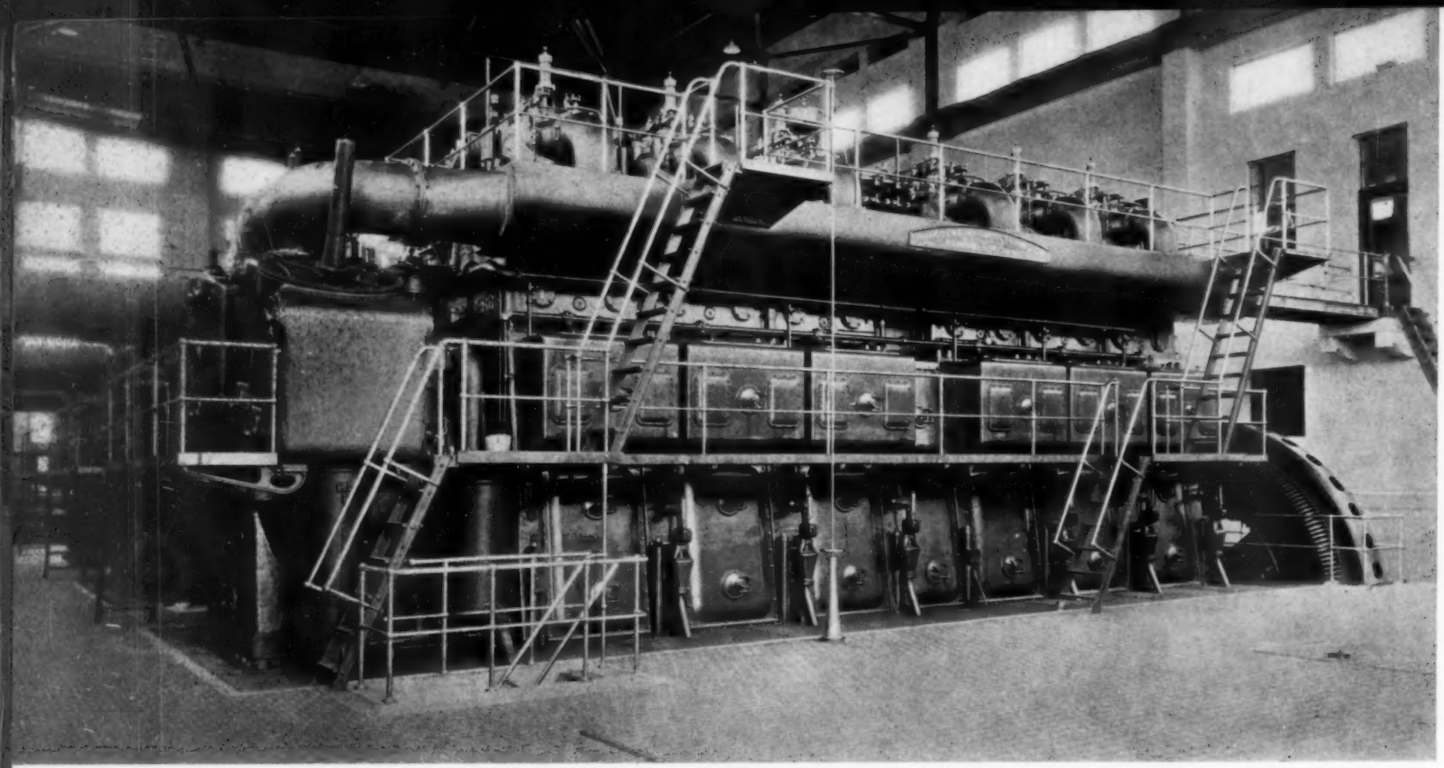
The Marine Division has under its supervision the handling and servicing of vessels using the canal en route, with the major part of its activities confined to the two harbors of Balboa and Colon.

The Mechanical Division is equipped and delegated to handle marine construction and repairs both for government and private vessels. Two large shops are maintained at Balboa and Mount Hope. Drydock facilities also come under this jurisdiction.

The Electrical Division, as the name implies, takes care of power generation and distribution.

The Dredging Division is responsible for maintaining an open and unobstructed channel throughout the entire length of the canal.

Naturally, there are other divisions which have no bearing on this discussion, but it is



One of three 4000 hp. Nordberg Diesels at the Miraflores Power Station.

important to note that each is a self-contained unit as regards personnel, equipment, responsibility and even finances.

Under the Electrical Division power for the Canal is ordinarily supplied by a hydro-electric plant located at the Gatun Spillway. Due to lack of water supply during the dry seasons, or if for any other reasons the water power plant should become inactive, some sort of reliable standby service is vital. When the old steam plant had reached its limit of usefulness for this purpose it was decided after careful consideration to replace it with Diesels.

Accordingly, on January 23, 1925, the Nordberg Manufacturing Company was awarded the contract for three direct-connected Diesel generating uits of 3,125 kva. capacity each. Each of these three engines is of the six-cylinder, two-stroke cycle, single acting, air injection type, having cylinders of 29 inch bore and 44 inch stroke. They are connected to Allis-Chalmers 2,200 volt, 25 cycle flywheel type generators and have a combined peak load capacity of 12,375 hp. As was the case of the steam plant, they are located at Miraflores, which is the distributing center for power to the Pacific Locks and is connected with the hydro-plant at Gatun by a thirty-mile transmission line.

Using Diesels for this service results in considerable saving, since no standby fuel is burned. and also the operating labor cost is much less than with steam. The fact that this plant will at times be the sole source of power for the operation of the Canal equipment is indicative of the perfect confidence now placed in the operating characteristics of the Diesel by those who are in a position know the possibilities of this type of power.

In the Dredging Division of the Canal are four Diesel vessels. There is a 24 inch suction dredge, *Las Cruces*, powered by four 1,000 hp. Fulton engines. There is the crane boat, the *Atlas*, with two Ingersoll-Rand 400 hp. direct-reversing units and three Cooper-Bessemer 75 kw. auxiliaries. These two work boats are continually busy in the channels of the Canal pumping silt into scows for removal. While slides sometimes occur, their job is further complicated by minor upheavals of the channel bottom so that considerable redistribution of material is necessary besides that towed out to sea and dumped. In almost constant towing service are two Diesel-electric tugs, the *Chagres* and *Trinidad*.

The I-R Diesel tug "Chagres," now in her ninth year of service.

These two boats were designed and built by the Mechanical Division in 1927 and placed in active service the following year, the *Chagres* with the Dredging Division and the *Trinidad* with the Marine Division. At the present time both are in dredging service, the *Trinidad* having been purchased from the Marine Division. The two tugs are substantially alike in construction, with hull particulars as follows:

Length overall	126 feet 5 inches
Breadth molded	28 feet
Mean draft	13 feet
Displacement, loaded	623 tons

Primary power is supplied by two Ingersoll-Rand, four cycle, six cylinder, solid injection Diesel engines of 480 horsepower rated output at 257 revolutions per minute. Each engine is directly connected to a General Electric 330 kilowatt 250 volt generator. The main driving motor is mounted on the single propeller shaft and his a normal rating of 750 shaft horsepower, which can be increased to 900 for continuous overload is necessary. On her original trials the *Chagres* developed a tow rope pull of 27,500 pounds and maintained a speed of 13½ knots.

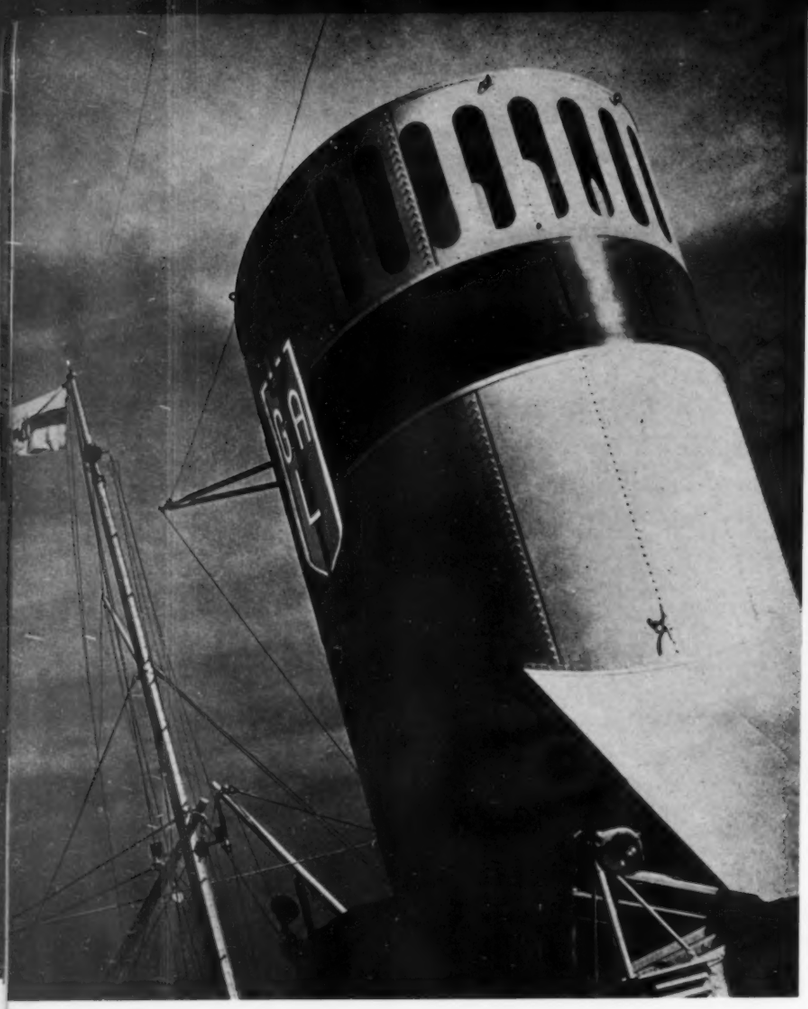
After approximately nine years of eminently satisfactory 24 hour service of these two tugboats, it is not surprising that Ingersoll-Rand Diesels were again purchased when two more were built for the Marine Division.

While the new vessels are slightly smaller than the *Chagres* and *Trinidad,* they have equal shaft horsepower of 750. All steel construction was used throughout, with the bows and sterns being pre-fabricated in the Balboa shop, after which the mid-section was built to conform with machinery requirements. Considerable time was saved by this ingenious procedure. The *Arraijan* and *Alhajuela* will be stationed at the entrance harbors of the Canal, one at Cristobal on the Atlantic side and one at Balboa on the Pacific.

As part of their regular duties in serving and handling ships in transit they will supply them with fresh water. Capacity provision for this is taken care of by a special deep tank forward of the engine room plue a forepeak tank. Due to the high percentage of standby time in the service of docking, towing and general handling of ocean liners and freighters, the choice of Diesel propulsion is especially justified.

The Diesel crane boat "Atlas" in dredging service. This photo was made at the moment the barge began to overflow.

Army wagon train crossing the Canal during maneuvers via Diesel ferry boat. Engines on this vessel were built by Washington Iron Works.



Poland's new Motorliner "Batory," her two main propulsion Sulzer Diesels and an interior view of the navigation bridge.

MOTORSHIP "BATORY"

WITH the arrival in New York harbor on May 27 of the M.S. *Batory,* named for Stephen Batory, sixteenth-century Polish king, who was the father of Poland's maritime ambitions, the Gdynia America Line now has two new Diesel passenger liners in active service between the United States and Poland. The *Batory* is a twin-ship of the *Pilsudski,* which was featured in the December, 1935, issue of DIESEL PROGRESS, and these two completely modern vessels are the first to be built by Poland for trans-Atlantic service since that nation attained her independence. They are very important factors in Poland's ambitious merchant marine program.

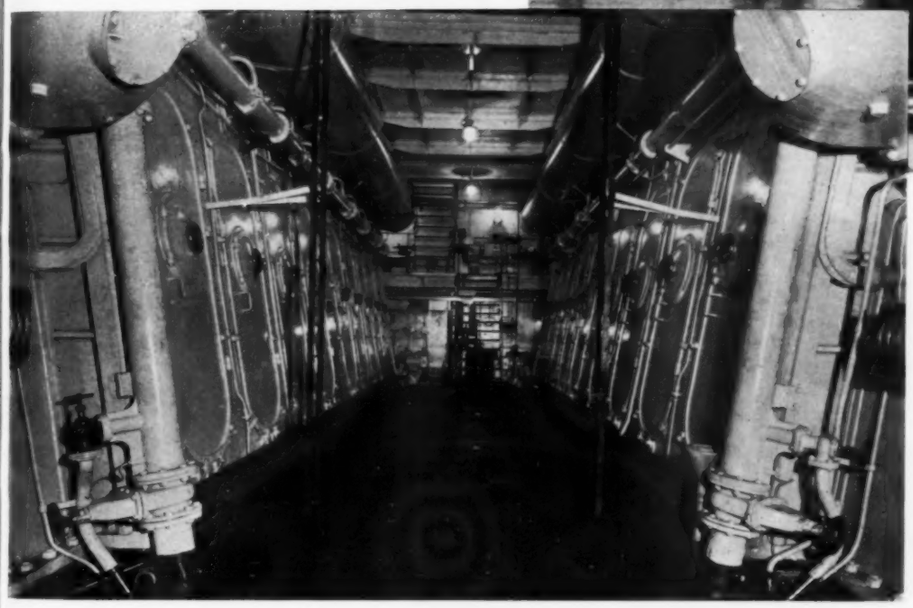
Upon the completion of the *Batory,* Italy concluded her part of a huge barter transaction by which the two ships were built in exchange for 31,000,000 zlotys (approximately $6,000,000.00) worth of coal to be shipped from Poland to Italian railways during a five-year period. Like the *Pilsudski,* the *Batory* is unique in that it is a "Tourist Top" ship, with tourist class accommodations the best available on board.

The *Batory* is 514 feet long, has a beam of 72 feet and depth of 25 feet. With a displacement of 16,000 tons she has 190,000 cubic feet of cargo space and staterooms to carry 760 passengers. The normal speed of 18 knots can be extended to 20 if required. There are seven decks, three of which are uninterrupted from stem to stern. Built primarily for comfort without ostentation, emphasis has been laid upon construction, safety and convenience. Electric welding has been used to a marked degree in structural joining.

Main propelling engines are two Sulzer Diesels, generating 6,500 hp. each at 130 rpm., and are directly connected to the propeller shafts. They are solid injection, two cycle cross head type units with scavenging and fuel pumps coupled directly to the engines. Auxiliary power is furnished by four two-cycle, single-acting, solid injection six-cylinder Sulzer Diesels driving 230-volt, direct current generators at 300 rpm. Any three of these auxiliary Diesels have sufficient power without overloading to supply the maximum current demand of the vessel. Both main and auxiliary engines are protected by DeLaval fucl and lubricating oil purifiers.

Waste heat boilers are fitted to each of the main Diesels and supply sufficient steam for all purposes on board, including heating, galleys and pantries, and steaming oil tanks. In this respect DIESEL PROGRESS feels that American manufacturers and Diesel users might well follow the lead of our foreign competitors and thereby further increase the efficiency of many Diesel installations, especially marine.

The American-made fire detecting and extinguishing systems on the *Batory* are considered practically perfect. The vessel carries forty-six



37 kilogram cylinders of Lux carbon dioxide gas. It is fitted with a nine line Lux Richaudio smoke detecting unit tapping cargo holds and machinery spaces. Flooding of these divisions with gas is manually controlled from the control station and, in addition, two Lux hose rack units are placed in the engine room and each equipped with two cylinders. A twenty-two circuit Zonit system protects all cabins and crew quarters. Quite obviously, any fire that may possibly occur on the *Batory* will be "an incident instead of a disaster."

The distance from Gdynia to New York is approximately 3,800 miles, which the *Pilsudski* has been making in eight and a half days. On her maiden voyage the *Batory* established a new record for this run of eight days and three hours. She now provides the fastest, safest and most comfortable passage from New York directly to Poland.

Operating in regular service at an average speed of slightly less than 19 knots, the new vessel is remarkably free from vibration, according to Mr. Charles Krebs, Operating Vice-President of the Gdynia-America Line. Mr. Krebs also expressed complete satisfaction with the operation and general performance of the Diesel engines with particular emphasis upon their economy. Since this is the second new Diesel liner to enter the service of this line within the past year, it is interesting to note the advantages of Diesel propulsion over steam which the officials discovered after careful investigation:

1. Full power is instantly available with Diesels from a cold start.
2. Economy of space with Diesels about 30 per cent.
3. Diesels require 15 per cent fewer engine crew.
4. Saving in fuel bunker capacity with Diesels approximately 50 per cent.
5. Saving in weight of fuel utilized for greater cargo capacity.

These are very powerful arguments in favor of Diesel generated power whether on the sea or ashore, and it is quite obvious why this fine new ocean liner is so equipped. DIESEL PROGRESS wishes to take this opportunity to wish the M.S. *Batory* many years of successful service.

DAMS AND ROADS

Cajalco Dam and the Ridge Route

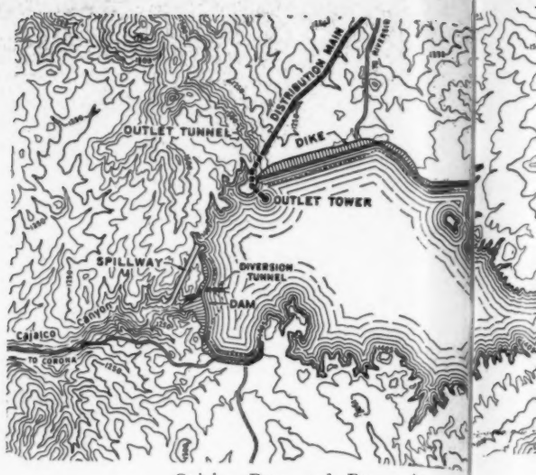
BOULDER DAM is ready and is rapidly filling with the waters of the Colorado River. The Colorado River Aqueduct that is to lead the impounded waters from Parker Dam, a hundred miles down stream from Boulder, is nearing completion as 150 construction camps along a stretch of 242 miles bore tunnels through mountains to connect with concrete-lined open ditch and conduit sections. Now, a final important link in the great water system gets under way between Riverside and Corona. This is the Cajalco Dam.

A recent visit to the site of the job where the Cajalco Dam is being built brought these pictures of one of the key machines on the speedy and low-cost work that Griffith Company of Los Angeles has to do to land the contract at $4,646,856, nearly $800,000 below the high bid. The Griffith Company is one of the great heavy construction contracting firms of the Southwest. It has had some of the toughest sectors of the All-American Canal, just above the Mexican border near Yuma. The new Ridge Route between Bakersfield and Los Angeles stands as a monument to their skill as modern road builders, and on dozens of other big jobs involving dirt-moving on a big scale, their men and machines are seen throughout the Southwest.

Here on the Cajalco Dam we saw a fleet of some thirty butane-burning trucks hauling from four Diesel and semi-Diesel powered shovels and draglines. Three new shovels were busy in one spot, but the machine that was making the dirt-moving record was this old veteran Bucyrus-Erie dragline powered by an Atlas Diesel engine that has piled up close to 30,000 hours' work, according to the operators on the job. It has been on the Aqueduct since excavation on that job started, working on Griffith's sector out southeast of Riverside for months on double shifts. Here it is swinging a 2-yard bucket on a 60-foot boom and burning 30 gallons of Diesel fuel per 8-hour shift.

The dam will be approximately a half mile long and 185 feet high, of earthfill construction, and will form a reservoir with a capacity of 100,000 acre feet of water. It will be the connecting link between the main aqueduct and the aqueduct distributing system that takes the water to the various cities in the Metropolitan Water District around Los Angeles — Anaheim, Beverly Hills, Burbank, Compton, Fullerton, Glendale, Long Beach, Pasadena, San Marino, Santa Ana, Santa Monica, Torrance, and others.

The reservoir will be formed by the dam itself, extending across Cajalco Canyon, says the official statement of the Metropolitan Water District, and by a dike to be built across the low rim on the north side of the Cajalco basin. The moving of more than 7,000,000 cubic yards of excavated material will be involved in the building of the two structures. The new lake formed will be three and one-half miles long and one and one-half miles wide.



Cajalco Dam and Reservoir (scale 7,000 feet to the inch).

Three views showing Atlas Diesel powered Bucyrus-Erie shovels at work on various sections of the famous "Ridge Route" and in excavating Cajalco Dam.

Here are pictures showing them at work on the Ridge Route of "Grapevine" terrors that only recently killed and maimed more autoists and truck drivers than any other stretch in the U. S., according to motor accident authorities.

The shovel is working with a 2½ yard dipper and the sturdy Atlas Diesel is burning 27 plus Diesel fuel at the rate of 35 to 40 gallons on 8-hour shift, depending on the going. It is using Pennzoil lubricating oil.

This pair of Atlas Diesel engines have been on the Ridge Route job for Griffith Company over three years now, they say, running night and day much of the time, 7 days a week, stopping only for service and a general swamping up, as service men call greasing, refueling water, cleaner service, etc. Over 2,000,000 yards, practically all rock, were moved by the pair on this job, said the superintendent. "And if you think these 130-foot rock cuts on the Ridge Route are tough, you should have seen them on the 100,000 yards of volcanic rock they ate through on the 5th Street job out of Pomona, where we had them before coming onto the Ridge. That was really tough!"

One of the pair, as previously mentioned, has been moved to the great Cajalco Dam job, where some 7,000,000 yards of dirt are to be moved to make the reservoir for the storage of the waters of the Colorado River when the Colorado River Aqueduct is completed and starts bringing an artificial river across 241 miles of desert to the cities of Los Angeles and vicinity in 1938. Here, as a dragline in nice black dirt,

. . . . *And now please turn to page 55*

Design of the dam was carried forward under the direction of Assistant Chief Engineer Julian Hinds of the District. Location of the structure, with special reference to the safety of the site and type of dam, was studied in detail by three successive boards of engineering consultants. October 31, 1938, is the date set for completion of the dam. Some 300 to 350 men will be employed for three years in its construction.

And now break out your highest decorations and get ready to hang them on the outstanding pair of heroes in the heavy construction war on the conquest of Time and the battle to make highway travel safe.

The singing of the above praises refers to a pair of Bucyrus-Erie power shovels (draglines in easy going when they get it) owned by the Griffith Company.

DIESEL EXCAVATION for HENRY HUDSON PARKWAY

SOMETIME in November of this year will occur the official opening of the new Henry Hudson Parkway. This four-mile stretch of broad concrete highway will prove a God-send to all motorists who enter or leave New York City north of the George Washington Bridge since it will eliminate the neck of the bottle now existing at the upper end of Riverside drive. As in countless other progressive construction projects, it is not surprising to discover Diesels participating in this work.

A sub-contract for excavating has been let to the Naclerio Construction Company who recently added to their equipment an Osgood "Chief" Diesel shovel. This unit is, at the present writing, performing excellent service in one corner of Van Cortland Park through which the new road passes. While it is com-

mon knowledge that Diesel economy and dependability have placed this type of power unit into practically every field of man's endeavor, there is perhaps no other service quite so exacting and demanding than excavating shovel work. To those who are familiar with the design and construction of present day Diesels, it is not surprising that this shovel is carrying its share of the job with flying colors.

The machine illustrated has a one and three quarter dipper capacity with a twenty-four foot boom and seventeen foot handle. The dipper is fabricated in two pieces with removable and renewable front and removable and reversible teeth. The all steel, inside type boom is both riveted and welded with heavy and numerous cross members for stiffening. Outside, composite handles are of full length steel bars and plates, filled with white oak and firmly through-bolted. Manganese steel racking is also through-bolted the full length of the handle as well as being welded to the bottom bars.

The Diesel powering this unit is a Buda-Lanova six-cylinder engine with a five and a quarter inch bore and seven inch stroke. It is rated at 133 hp. at 1,000 rpm. and 156 hp. at 1,200 rpm. thus delivering ample power to make the shovel one of the easiest handling and most obedient excavators on the job. It responds vigorously, is smooth in performance and quiet in operation. These features added to a reduction of from 75 to 80 per cent in the cost of fuel certainly demonstrate beyond the shadow of a doubt why contractors in all sections of the country are specifying Diesels when ordering shovels, tractors and draglines. Another perhaps less obvious economy yet in many cases of considerable significance is the fact that when Diesel fuel oil is stored along roadway construction instead of gasoline there is no temptation for some workmen of questionable honesty to siphon it into the tanks of their private automobiles.

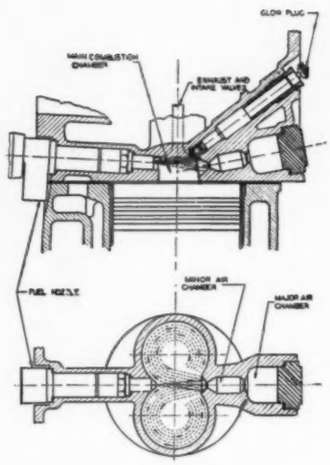
While the name "Buda" has stood prominently in the Diesel field for many years, this new type Buda-Lanova incorporates certain improvements which may not be so familiar as yet. With a compression ratio of but 12½ to 1 and a high "workable" mean effective pressure due to well controlled turbulence for combustion, combined with a low maximum combustion pressure, this new model functions very comparably with a gasoline engine yet still retains desirable Diesel economy. Long life for all moving parts and smooth running are made possible by the fact that the rate of pressure rise is well within the accepted limits of good gasoline engine practice. The Buda-Lanova Diesel has a maximum pressure of not over 625 lbs. per square inch.

The diagram on page 46 illustrates the principle of the Buda-Lanova combustion system.

The fuel, leaving the nozzle and passing along the common center of two lobes formed in the cylinder head under the inlet and exhaust valves and directly over the cylinder proper — passes through the hot compressed air, which is generated in the compression stroke, into minor and major air chambers or energy chambers.

This fuel air mixture, which is fuel in conjunction with the air picked up in the passage of the fuel as above described, traveling together and passing through an orifice of venturi form, causes a very violent combustion upon its entry into the energy chambers.

The combustion set up in these energy chambers violently discharges back into the main combustion chamber, thus impinging on such



residual spray as is still leaving the nozzle and is in suspension. This counter-flow or backfire of the energy chamber sets up a violent turbulence, which is divided in such a manner as to create a right and left rotary motion in that lobe under each respective valve.

This self-induced turbulence so thoroughly mixes all atomized fuel with its proper air content that this type of combustion has been proven to operate under all ranges of speed and allowable load up to rating, on the minimum of excess air.

This system of induced turbulence from internal means gives what has been long sought for as the substitute of air injection effect in solid injection engines. It gives accelerated burning and progressive rise in pressure by accelerating the end of the combustion cycle instead of the beginning.

A two-current cooling system and an injection nozzle design that keeps flame and fuel from striking either pistons or cylinder walls assures piston temperatures no higher than in ordinary gasoline engines. All reciprocating parts of the injection system are subjected to minimum wear by a low injection pressure. Starting in severe cold weather is easily and quickly accomplished by means of Edison glow plugs which are standard equipment.

The advantage of high mean effective pressure available with the Buda-Lanova engine coupled with low maximum combustion pressure, makes a highly desirable combination from the standpoint of the Diesel user and these units are finding exceptional favor wherever they have been installed.

NAMM DEPARTMENT STORE

. . . . *Continued from page 24* . . . .

The other two engines have heat exchangers in the exhaust and no silencer.

Cooling water for the engines is normally provided by a closed system supplied with city make-up water, thus avoiding trouble from scale in the engine. In case of emergency, however, cooling water can be supplied direct from the city mains or from the building roof tanks thus giving three sources of cooling water supply.

All of the hot water requirements of the store are provided by two Foster-Wheeler heat exchangers in the exhaust lines of two 200 kw. engines. A 20 gpm. pump takes water from the surge tank of the engine cooling system and delivers it through either of the heat exchangers to either the existing hot water heater or a new roof tank. The pump is under pressure control to shut down when the roof tank becomes full. A thermal syphon between the roof tank and the heaters provides circulation through the heaters when the pump is not operating.

A new type Ward Leonard voltage regulator is used for each generator. It employs electron tubes which rectify current from the alternating current bus, supplying direct current to the field of the exciter. Principal regulation is obtained by changing filament current and not through grid control. Automatic relays cut in self-excited fields on the exciter in case of tube failure and during starting up of an engine set.

Frequency control is obtained by a two-clock system, one of which is operated by connection to the central station system for this purpose only.

The total cost of the Diesel plant and air conditioning is $275,000, of which about $170,000 was spent for the Diesel plant and electrical changes necessary. Present indications and estimates of maintenance made by the store's Engineers indicate that the Diesel plant will pay for itself out of savings over previous costs for central station service in six years. Based on the consumption of 2,240,000 kwh. per year operating costs are estimated at 0.8 cents per kwh.

ISOLATION OF ENGINES AGAINST TRANSMISSION OF VIBRATION

By S. ROSENZWEIG

THOUGH their six-cylinder engines installed in the Namm Department Store,

Brooklyn, are completely balanced as to free forces and couples, Worthington engineers required that the foundations be isolated by steel springs because of their decided advantages over other isolating materials. With the approval of Messrs. Madeheim and Rosenthal, the consulting engineers, the Korfund Company of Long Island City, New York, was asked to submit plans. The designs developed by the Korfund Engineering Department were accepted as suitable and installation was made accordingly. The remarkable efficiency of steel spring suspension in isolating machine vibrations is not merely due to the size, shape and the well-known elastic properties of the steel from which it is made, but to a greater degree to its flexible adaptability for assembly in single and multiple units, in accordance with established scientific and practical principles to meet known loading and frequency requirements.

The possibility of breaking or loss of resiliency from fatigue caused by continuous service in a spring vibration absorber is practically nonexistent. The play of the spring due to the machine's vibrations or impacts is but a few thousandths of an inch at the most. Compare that with the action of an automobile valve spring closing and opening more than ¼" about 300,000 times during a short day's run. How often does one hear of a broken valve spring? It is because the endurance limit of a particular combination of wire size and spring dimensions may be so specified as to have a safety factor far exceeding the requirements of actual operation.

Two channel irons (or more if required) extend over the entire length of the foundation block. Rows of Vibra-Dampers placed at intervals support each channel iron which is firmly united to every Vibro-Damper by means of a strong and sturdy cover. These covers are made large enough so that all the springs can be removed through a corresponding opening cut into the web of the channel. Stiffness of the springs can be changed by allowing a threaded bolt to move a steel plate placed over the springs. By a slight turn of the bolt, their tension may be changed and consequently the load sustaining capacity of the damper. Openings in the foundation are provided directly over the dampers, or sideways, to give access to all parts of the damper. (New designs have since been developed which permit complete removal of damper housing).

As the channels are solidly embedded in the concrete foundation, the latter is, of course, also resiliently supported on the dampers. The actual assembly of the dampers and the pour-

ing of the foundation over them is rather interesting and ingenious. The spring housings with springs removed are lined up on the sub-foundations in their respective positions, carefully levelled, bolted down and grouted in.

The channel irons are now placed over the dampers (tied to them in the manner described) with edges resting on the sub-base. The entire area is then covered with asphalt felt and the joints along channels carefully closed with mastic. The concrete is then poured over the entire assembly into the space provided. The whole block now rests on the sub-base separated from it only by the layers of asphalt felt. The block can be easily lifted by means of bolts inserted in the damper covers until it reaches the position provided for it in the design of the damper. Lifting of each foundation is very simple taking less than one-half hour with two men working. The cadmium plated springs are inserted in the dampers after engines are erected; foundations are carefully re-levelled and everything is ready for quiet and vibrationless operation of engines.

The dampers furnished are of two different sizes, one having a loading range of 8,500-11,000 pounds and a smaller one with a range of 6,500-9,000 pounds. One foundation is supported by fourteen dampers, three foundations by ten dampers each and two foundations by eight dampers, making a total of sixty dampers, having a combined load capacity of more than half a million pounds.

CONSTRUCTION of 20 two-car, lightweight, stainless steel, electric trains has been begun in France by the Carel Fouche Company, a licensee of the Edward G. Budd Manufacturing Company, of Philadelphia, and will be completed this year. The trains, being built for the State Railway, will be operated between Paris and Le Mans.

Each of the two-car articulated trains is 40 m (131.2 ft.) long and weighs complete 50 tons. It is power by six motors, one on each axle, totaling 1,250 hp., the current being supplied by overhead catenary. Maximum speed is 150 km (93 miles) per hour, and acceleration 2.7 mph. per sec. There is a driving compartment at each end.

RAILROAD history was made when the Burlington Railroad celebrated the attainment of the millionth mile of *Zephyr* service by "jumping the hoop" with one of its streamlined, stainless steel *Zephyrs*. The actual millionth mile was recorded by one of the Diesel-powered twin *Zephyrs* servicing Chicago and the Twin Cities. As the *Zephyr* broke through the hoop it severed a wire sending an electrical impulse signal to the Grand Ballroom of the Palmer House, where more than 1,000 industrial leaders were assembled as guests of the Chicago Association of Commerce to hear addresses by Charles F. Kettering, famed inventor and research engineer, and Ralph Budd, Pres., of Burlington Lines.

LONDON LETTER

. . . . *Continued from page 33* . . . .

Petrol cost, annual mileage 73,000 Petrol at 1/1¾d per gal. 8 mpg.	£503.	16.	6
Diesel fuel cost, annual mileage 73,000. Fuel at 1/0½d per gal. 17/18 mpg.	£203.	0.	5
Mpg. at commencement over 20			
Gross saving by a Perkins Diesel per bus per annum	£300.	15.	1
Extra cost of Perkins engine (over petrol engine) roughly £150. Depreciated over 3 years, write off	£ 50.	0.	0
Net saving by Perkins Diesel per bus per annum	£250.	15.	1

(1,254 shillings)

The capital we would have to invest in gilt-edged securities to give us an income equal to this saving would be £250 x 100 divided by 3½, i. e. £7,142 (35,710 shillings).

For SAMUEL MORGAN, LTD.,
(Signed) *R. F. H. Wilson,*
Director

A point of increasing importance to British Diesel engine manufacturers is the question of export. For some years the returns have been going up and now to the majority of firms export sales are one of the brightest spots in their turnover schedules. All the principal types of Diesel, such as Leyland A.E.C., Perkins, Dorman, Dennis and Thorneycroft, are well represented in the Colonies, but the concern with perhaps the best reputation of all overseas is Daimler, of Coventry.

This company has built specialized passenger chassis for over 6 years, and for the greater part of that time the standard engine has been the L. W. Gardner. In fact, although Daimler's make their own petrol engine of particularly attractive design, they have been unable to oust the Gardner engine from favor.

The two engines used mostly today are the 5 L W and 6 L W, the numeral denoting the number of cylinders employed. The 5 L W has a swept volume of 7 litres and the 6 L W 1.4 litres more, their respective power outputs being 85 and 104 bhp. at 1,750 rpm. The outstanding features of the L W type engine is its low fuel consumption (.36 lbs. per bhp.-hour) and dependability, and in conjunction with the simple yet effective Daimler chassis incorporating fluid flywheel and epicyclic gearbox they combine to produce a vehicle with a thoroughly sound road performance and unusually long life. Undoubtedly these are the properties that have so endeared the Daimler chassis to Colonial operators.

To conclude this letter fittingly here is another testimonial, this time from overseas. It appeared under the heading "He ran his car on ant-killer," and comes from the London *Daily Mirror*.

"Mr. G. H. Johnston, of Stafford (England), who is trying out a Diesel-engined car in Australia, has discovered that his car runs as well on white ant-killer as on ordinary crude oil,' says a Reuter Adelaide message.

"Mr. Johnston took the Diesel engine over from England with him and installed it in a car in Melbourne. When fifty miles from Brisbane he ran out of crude oil. He walked to a farm to try to borrow some kerosene, but found there was none. He then noticed a dark, heavy, oily substance in a tin and decided to give that a trial. The engine purred triumphantly into Brisbane – using white ant killer." There's no knowing what a Diesel can do!

SAND AND GRAVEL

. . . *Continued from page* 27 . . .

Responsibility for the constant day and night operation of the Goodwin-Gallagher Diesel tug fleet rests with Mr. Bade, the Port Engineer. He was well equipped when he took over this job ten years ago, by reason of his long and varied previous engine experience. The hundreds of marine installations made in the Metropolitan District created experienced Diesel operators, from which the best were chosen. Although these Diesel tug engines can be operated with pilot house controls, the saving of an operator's salary was sacrificed in favor of twenty-four hour engine duty and low maintenance costs. As an example of how this works out, the record shows that maintenance cost for the 700 hp. pump scavenging engine operating the flagship *Gene Pope* has averaged less than $100 a year. The maintenance costs for the other Diesel tugs are proportional. This establishes an enviable record considering the work and hard usage made of these Diesels. It is a striking tribute to the operators and designers alike.

More than a thousand bells a day characterize the maneuvering needs of the Goodwin-Gallagher Diesel tug fleet. A counter put on the engine room bells of one tug registered 370 signals in a period of two hours. Tugboat men say this is exceptional and naturally the Diesel engines must be in good working order, so as to respond promptly to avoid damage and unnecessary maneuvering delays. Work for the Diesel tugs originates with the two shifters stationed at Port Washington, where the oldest 100 hp. engine is on the job twenty-four hours a day, and at Northport, where a 60 hp. Diesel in a small tug does the work for the small sum of seven cents an hour. These tugs put the empty scows into the loading docks, remove the loaded ones to the stake boats and occasionally make deliveries across the Sound. From this point on, activities center around the flagship *Gene Pope*, which usually makes the long hauls. She picks up as many as 29 or 30 loaded scows from Northport and Port Washington and tows them to the stake boat off College Point. In between runs this tug is employed for river and harbor work. Deliveries to distributing stations on river, harbor, creek and Sound fronts are made from this point by the smaller Diesel tugs, *Catherine Pope*, *Wm. E. Reed* and *Colonial*. All empty scows are usually returned to the stake boat and made up for towing to the sand pits by any one of these tugs which happens to be available. The work is carried out with clock-like precision,

making these the busiest tugs in the Metropolitan District.

Every one of these tugs is modern, lacking only the fine appointments found on a yacht. Old experienced tug boat men know that a good dependable engine in a strong hull, operated by a competent crew, is all that is needed for a successful and profitable enterprise. These features are embodied in the *Gene Pope*, the flagship. She measures 100 x 26 x 10.5 feet; was built at Port Washington by Goodwin-Gallagher from plans drawn by Brown and Demarest, Naval Architects of Tottenville, Staten Island, N. Y. Like each of the other tugs, she is equipped with a Fairbanks-Morse engine. This Diesel, installed when the boat was first built, is a 700 hp., two-stroke cycle 16″ x 20″ pump scavenging machine. The auxiliaries include a 20 kw. Fairbanks-Morse Diesel-generator set and 50 cu. ft. compressor and a 10 kw. shaft driven generator. The motor driven pumps include a 20 hp. fire and wrecking pump and 2-hp. deck wash and circulating pump. A 7½ hp. electric motor turns the capstan. The main engine has "built-in" auxiliaries, consisting of air compressor, circulating water, oil and bilge pumps. The engine room is spacious and attractive. The main engine is operated by remote control from the upper engine room. From this point the engineer can check on performance by a glance at the various meters and gauges installed there. This tug has a crew of nine men for twenty-four-hour duty; whereas, the same tug with steam power would require thirteen men for the same work day. This represents a substantial saving in labor and subsistence costs, which in no way reduces operating efficiency or safety. It costs less than $1.50 per hour for fuel and lubricants to operate the *Gene Pope*. The engine swings a three-blade Ferguson 93 x 46″ bronze propeller at 240 rpm.

The *Catherine Pope*, ranging next in size, measuring 85 x 21.4 x 9.4 feet, was built in 1927 when her present 6-cylinder, 360 hp. engine was installed. The engine room arrangement is somewhat the same as the flagship. The main engine, auxiliaries and tanks are set up in the engine room proper with the operating controls, meters and gauges located in the upper engine room. Eight men make up the crew for twenty-four hour day and night duty. This is a busy tug, handling what seems more than she was built for, but nevertheless, getting away with it. In running light between Port Washington, River Points and Port Newark, the *Catherine Pope* attains a speed of

eight miles an hour. In every sense of the word she is a "work horse", having been used as an ice breaker and making it a practice to tow from 10 to 24 loaded sand scows. This work averages less than a dollar an hour in fuel and lubricating costs.

The *Wm. E. Reed* has been working steadily since the day she was built in 1926, with her present four cylinder 240 hp. Diesel engine. She measures 58.8 x 17.4 x 8.2 feet, averaging a speed of nine miles hourly whenever running light to points on the Sound, East and North Rivers. Engine room limitations eliminate upper engine room control, but due to a compact installation of main engine and 5½ kw. Diesel generator set and other auxiliaries, ample space has been provided for operating the engine. This tug often accomplishes what would be folly for others; as, for instance, taking four loaded scows through Hell Gate. Some tug boat operators might consider this poor judgment. On the other hand it expresses the faith of the Captain and the Engineer in the engine's ability to meet every emergency. The average hourly cost of keeping this tug busy is 60 cents for fuel and lubrication.

This year, the tug *Colonial* joined the Goodwin-Gallagher fleet. It was built in 1890 when she was known as the *Lulu R* and was formerly powered with steam. Nine years ago this tug was modernized with the installation of a Fairbanks-Morse 6-cylinder, 150 hp. Model 35 Diesel engine and renamed the *Beckwith*. She was placed in service by Goodwin-Gallagher April 1, 1936. This tug measures 73.2 x 16.3 x 5 feet and when running light between College Point, Eastchester, Port Chester and Connecticut shore points, her speed is about ten miles per hour. Tests prove her capable of handling three loaded scows with ease. Main engine auxiliaries include a 3 hp. engine driving a compressor and belted centrifugal bilge pump; also a 600 watt 32 volt tail shaft generator. This tug operates on a fuel and lubricating cost of 35 cents per hour. It is in service 24 hours a day with a crew of six men.

The *Gene Jr.* is one of the shifting tugs stationed at Port Washington in which the old, but still active 100 hp. C-O two-cycle engine is going strong. This was installed at the time the tug, which was formerly the *Zack*, was built at Port Washington in 1924. She measures 37.6 x 12.5 x 6.0 feet and had a crew of three men for daytime operation, which was recently increased to six because the tug is again in 24-hour daily service. This tug handles as many as 45 scows in one day, pulling them in and out of the washer to the local stake boat. Her working capacity permits the shifting of seven to nine loaded scows at one time. Fuel and lubricating costs averages 31 cents per hour.

The shifting tug *F. R. Pope* is the baby of the fleet—the favorite, which has evoked considerable comment because of the hard usage the engine has to withstand; first running light and then fully loaded as is the case throughout the fleet and secondly, on account of its unbelievable low fuel economy—¾ of a gallon per hour. The *F. R. Pope* is not a new boat. It was built in 1920 and measures 34.8 x 10.4 x 4.45 feet. Up until February 1, 1936, it was propelled by a 35 hp. gasoline engine. The danger of such an installation was forcibly expressed when the boat caught fire late last year. This prompted an immediate replacement with the Fairbanks-Morse four-cycle, six-cylinder, 60-hp. Model 36 Diesel engine, which was compact enough to fit the old bed with but few inexpensive changes. One man operates the boat. He navigates, runs the engine with a pilot house control and deck hands. The pilot house is situated so that all requirements can be met with ease and dispatch. Fuel and lubricants average seven cents per hour.

Complete Diesel success can therefore be summed up in terms of flexibility, reliability and operating economy. Regardless of how hard the service, such things as experience, design and materials contribute to long life usefulness. This record of exceptional Diesel engine service in Goodwin-Gallagher tugs indicates the profitable advantages, the growing trend and how other fleets can be made into money makers through the use of suitable Diesel engines.

DIESEL TRACTION IN ITALY

. . . . *Continued from page 36* . . . .

based on the general lines of the Breda Diesel-engined rail car, which can carry 56 passengers and has a weight of 22 tons. The frame of such rail cars is of steel and extensive electric welding has been employed in its construction. The passengers are accommodated in the central part of the car in two ranges of seats separated by a corridor. There are two entrances with two doors each, and two driver cabins besides the toilette, a baggage room and a room for large size luggage. The main dimensions of such rail cars are as follows:

Maximum length	21.360	meters
Total length of steel frame	21.000	"
Maximum breadth of frame	2.750	"
Maximum height over rail level	3.200	"
Gauge	1.435	"
Distance between truck pivots	15.100	"
Weight of car empty	21.500	kg.
Weight of car ready to start with water reserve, oil, etc.	22.500	"
Weight of passengers and freight	8	tons
Maximum speed on line without gradients	140	km/hr

The frame is mounted on two trucks provided with axle roller bearings and with special devices to prevent vibration. The car is provided with compressed air brakes of Westinghouse type. There is also a hand brake in each driver cabin, and on each truck has been mounted an engine, while the fuel tanks, the electric accumulator sets and the radiators are placed in the car. Each engine is entirely independent, having having six cylinders with a diameter of 115 m/m and a stroke of 142 m/m rated at 130 hp. at 2,400 rpm. Two resistances of 500 watts at 150 volts each have been fitted to the monobloc in order to maintain the engines hot during the night. The cars are provided with the Wilson type speed exchange device at five speeds. Each driving wheel has two sand ejectors operated with compressed air. The heating of the passengers' compartment is accomplished by the circulation of the engine cooling water into special apparatus placed below the seats of the passengers. Electric lighting is furnished by means of two accumulator-generating sets. Below the floor of the car there are the fuel tanks of a capacity of 360 liters insuring to the car an independent radius of 650 to 750 kilometers. During the trials with such rail cars which have occurred between Florence, Marradi and Faenza with gradients up to 3 and 5 per cent. between Bologna and Florenza with gradients up to 2 and 3 per cent and between Milan and Venice without any important gradient, it has been possible not only to attain, but also to exceed, the speed of 140 km per hour. During the trials carried on on level lines the following results have been reached: 20 km/hr. in 9 to 10 seconds, 30 km/hr. in 12 to 14 seconds, 60 km/hr. in 45 to 47 seconds and 100 km/hr. in 115 to 125 seconds.

In the streamlined Diesel-engined trains which are to be employed on the Turin, Milan, Venice, Trieste and on the Milan, Bologna, Ancona, Brindisi railways there will be special aluminum and special steel alloys frame. The train consists of three articulated cars. In the forward car there will be the engine room with annexed driver cabin. Two Fiat Diesel engines of 800 hp. will insure an average speed of 160 km per hour with a maximum speed of 180 km per hour. Special arrangements have been made for proper ventilation by means of fans fitted on the top of the cars, since the glass windows will be set in special rubber bearings to eliminate the noise and vibration from the high speed. Only first and second class service will be undertaken. Another interesting application of Diesel traction in Italy may be expected to result from the research work which is just being carried out by the Italian State Railways Administration in regard to the possibility of building a special type of Diesel-engined rail car suitable for the lines on which now steam traction with a third toothed rail is employed.

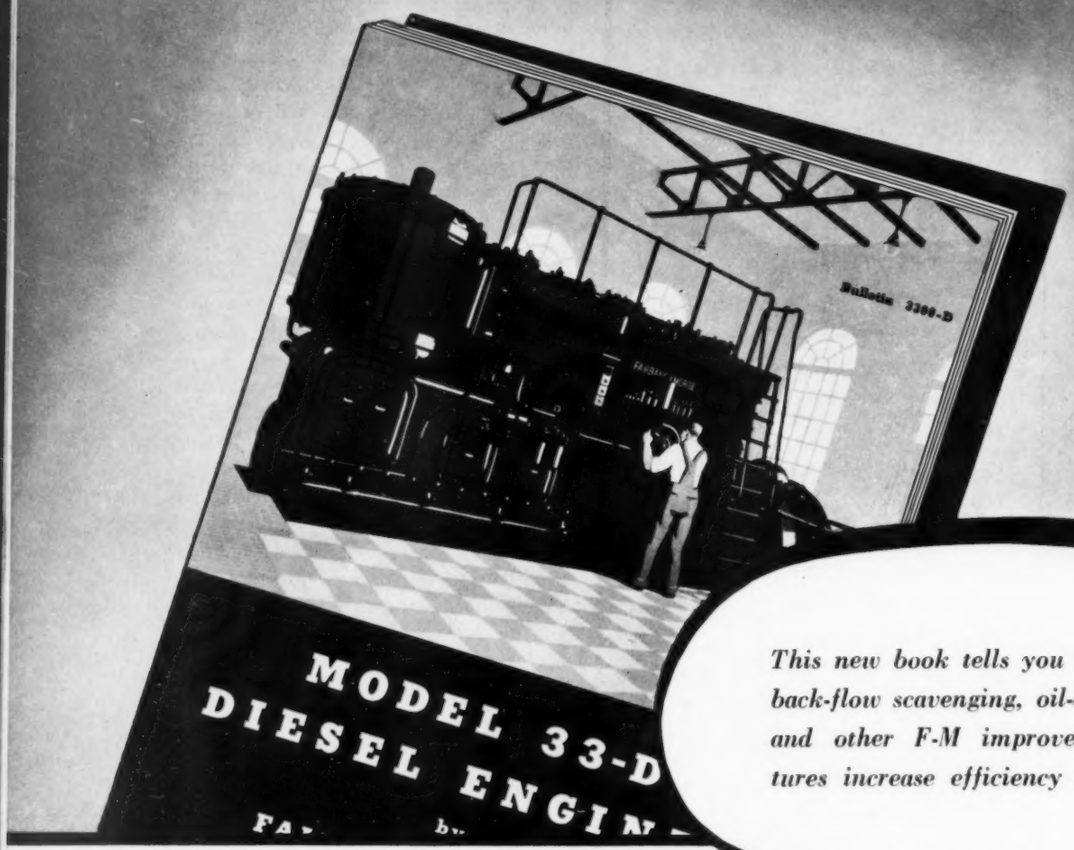
DAMS AND ROADS

. . . . *Continued from page 43* . . .

the veteran Atlas Diesel-powered machine is setting a dirt-moving record that is the talk of Southern California contractors.

Perhaps when the history of this country is written some centuries from now, it will be the work of the road building contractor and engineer that will stand out as our contribution to the permanent things that give our civilization rating among the nations and peoples of civilized histories. It is certainly the thing in which our people are leading the world at the present time, and its effect in making a nation out of widely scattered states and ideas is all-important. From the standpoint of business, social contacts, national defense, education, cultural advance, agriculture, etc., the work of the highway builder is more important than many have thought. His tools and equipment are only secondary to his brains, and here, as usual, the Diesel engine is making an enviable record for itself.

What shall we look for in big Diesel design?



This new book tells you how improved back-flow scavenging, oil-cooled pistons, and other F-M improved design features increase efficiency and cut costs.

What mechanical features should every prospective Diesel owner insist upon in his new engine? Which ones will keep fuel costs down? Which ones will lower operating attention? What features found in some Diesels are actually superfluous and should be dispensed with in a modern engine?

If you are planning on Diesels, get the answers to these and many other questions in the new booklet on the 33-D. It explains, clearly and simply, how Fairbanks-Morse builds its big type "33" Diesels—why its advanced features of design offer you more for your money. For your copy, simply address Department J-81, Fairbanks, Morse & Co., 900 S. Wabash Avenue, Chicago, Ill. 34 branches at your service throughout the United States.

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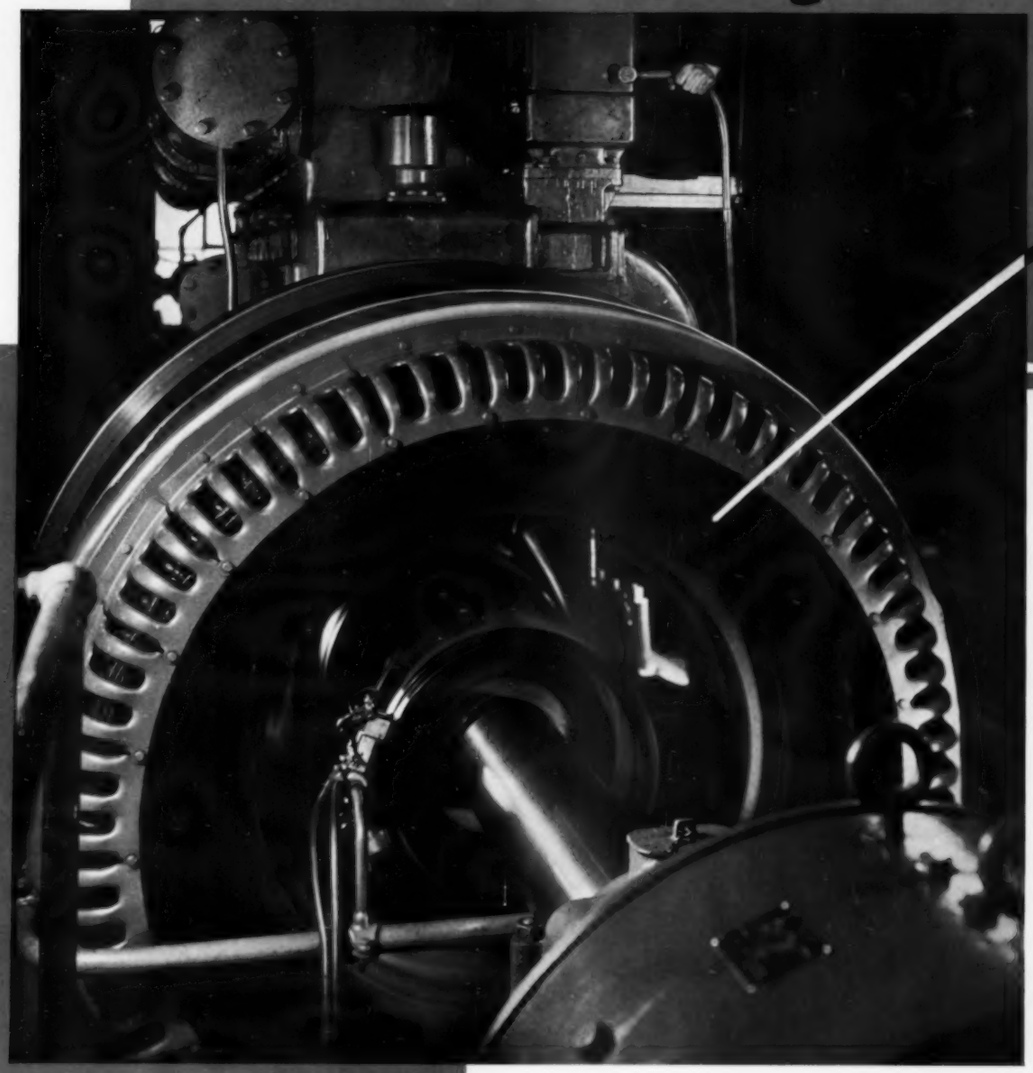

YOU expect the generator on a Diesel engine to run along smoothly, quietly and efficiently. You hardly give it a thought. And you are right. Provided, of course, you gave due thought to the generator when you installed it.

When you are examining generators look at the heavy, rugged, cast construction which characterizes Elliott generators. It is one of the essentials of smooth, steady operation. Strong parts, rigidly held in place, further contribute to the elimination of vibration and freedom from trouble.

Elliott generators are built right in every respect — engineered exactly to the Diesel with which they are joined.

●

If you are interested in details, we would like to send you our discussion "The Marks of Quality in Engine-Type Synchronous Machines." It doesn't ballyhoo Elliott generators. It just points out details which will interest you.

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for
DIESELS

ELLIOTT COMPANY PITTSBURGH, PENNSYLVANIA

Electric Power Dept., RIDGWAY, PA.

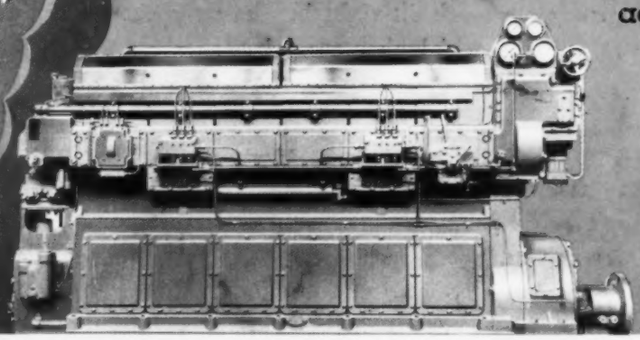
District Offices in Principal Cities

J-651

WHAT IS UNUSUAL ABOUT THIS?

Try as hard as you will — and no matter how experienced you are with tug boats, you will not be able to actually see anything unusual about this Diesel powered tug.

The facts are, Guy W. Pink, District Engineer, Department of Public Works, State of New York, will tell you the only unusual thing about this tug is its low cost of operation and ease of handling. The explanation is: there is a Cooper-Bessemer Diesel in the engine room. The sturdiness and economy of these engines particularly adapt them to tug boat service.



TYPE GN

This is one of the latest N line engines built in 3, 4, 6 and 8 cylinders, covering a power range of 100 to 500 H. P. Ask the nearest branch office for any information on Cooper-Bessemer Diesels.

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